VIRGINIA WILDLIFE

FEBRUARY 1993 ONE DOLLAR

Special Nongame Section

Out on a Limb

"Life is hard. Can't buy happiness no matter what you do. Can't get to heaven on roller skates; can't take a taxi to Timbuktu."— from the song "Life is Hard" by the group ***Timbuk3****.*

Talking about the plight of endangered species can be as insufferable as talking about being in love. Things tend to get vague and redundant once you've blurted out so much that you have to take a deep breath to continue. If you're still talking after about 30 seconds, people don't take you seriously.

After all, we've heard it all before. And, frankly, though we'd very much like to believe, we've seen love fade too quickly and we know in our hearts that endangered species will *never* have enough room to survive.

Nonetheless, it seems we can't help pestering one another about such inexplicable things, even if we end up looking silly and foolish in our earnest attempts to make people understand what we mean. So, why keep trying? ("*Excuse me, but your 30 seconds are up...*") Because...

"Some things just don't make sense," my friend Brenda once patiently explained to a very logical woman who was bound and determined to explain her way out of a very illogical situation.

"But, they *must*," replied Dudley. "If I just think about it a little more, it will all become clear."

Brenda just smiled that quiet, mischievous smile of hers and let Dudley talk herself into a muddle.

Endangered species (like love) are one of many things that don't make much sense. Now they're here and now they're not. The whole idea is hard to grasp. It's kind of like imagining a long-tailed dinosaur chomping on grass in the middle of your lawn today and vanishing tomorrow, leaving only giant hoofprints in your yard. It could not happen. Quite illogical.

So it is when you're holding a loggerhead turtle hatchling in your hand, with its tiny claws scratching at your palm and its squirming body so full of life. It's impossible to believe that you just may be looking at the last one of its kind. *The End. Nevermore...*

Of course, when they're gone, we finally believe, and with broken hearts we promise ourselves that it simply won't happen again, until one day...

"Well, how much habitat do they need, anyhow?" you mutter to the smug biologist looking out across your land.

"Well, we don't really know, but we're sure that the bird needs that piece of beach property you just bought to build a house on."

"Why me?" you wail. *"Why not my neighbor's land? Why do I have to take responsibility for the last @*&$%@#! bird that lives on the East Coast? And, besides, you can't tell me that I'm going to make all the difference to this bird, anyhow!"*

Truthfully, we can't. We don't *really* know how to save a species, all because of one huge question we haven't answered yet. We haven't figured out how much habitat *we* need to survive. Since we haven't put limits on ourselves (and, of course, we *are* the first priority when it comes to space), it's impossible for us to define the limits for other species. It's like going out into the middle of nowhere armed with fencing material and rounding up all the hundreds of thousands, maybe millions of species that live there and saying to each one, "O.K., how much space do you need?" and each one replying,

"Uh, I dunno. Maybe all of it. Well, take that back. Maybe not. Uh.. come to think of it, I think I'd like it all."

It's enough to push someone like Dudley over the edge.

It seems quite impossible to sort out an equitable solution, if you ask me. That is, if you're bent on one that makes sense.

My mother used to play the piano when I was young, and around Christmastime, when a bunch of us five-year-olds had run out of pleasant and socially acceptable things to do to one other, Mother would entertain us with her music. She would instruct us all to crouch low to the ground.

"You are now flower seeds, deep under the earth" she would begin. And, playing softly at first, she would identify each young tousled head rolled up in a ball on the floor as "rose," "pansy," "daisy," or "primrose." Perhaps she named some of the boys after vegetables, but I can't remember.

The music would start to patter. "Now, the rains have come," sang Mother. "You have started to grow."

We would slowly uncurl, stretching up delicately toward the sun beyond the painted ceiling that we could see with our young eyes. We were intent upon becoming the most beautiful, most wonderful flowers that ever were. With the music rising, we would dance. Swaying and twirling into awkward pirouettes, we entertained Mother as well as ourselves until the song slowly ended with a flourish. With a squeal, we would demand that it be played again.

As children, we naturally became violets, grasshoppers, or ponies. We believed in it all for a moment, easily shifting from one form into another, gliding inside and out of flowers, fishes, and birds. We've all grown up, however, and forgotten the importance of changing shapes.

We've learned the importance of other things. We now know the security of possesion, the comfort of reason. We have learned to deal with lost opportunities.

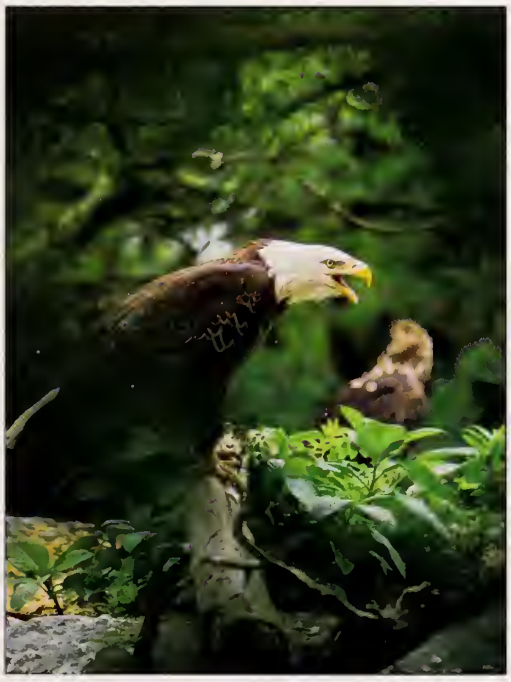
So, when we talk today about the needs of other species, we hesitate. It has taken us so long to get this far, and so much heartache to learn this much. We are troubled by things that don't make sense.

"I cannot understand another species," you moan. "It is as incomprehensible as love."

You are wrong. The child remembers both, and believes.

Virginia Shepherd

VIRGINIA WILDLIFE



Special Nongame Section: *Read about the work VDGIF's Nongame and Endangered Species Program has been doing for fish and wildlife in the state, from bald eagles* ***(above;*** *photo by Bill Lea) to bog turtles (****top right;*** *photo by Bill Lea). We've come a long way, but we've still got a long way to go.*

Cover: Bald eagle; photo by Bill Lea.
Back Cover: Great blue heron; photo by Lynda Richardson.

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Dedicated to the Conservation of Virginia's Wildlife and Natural Resources

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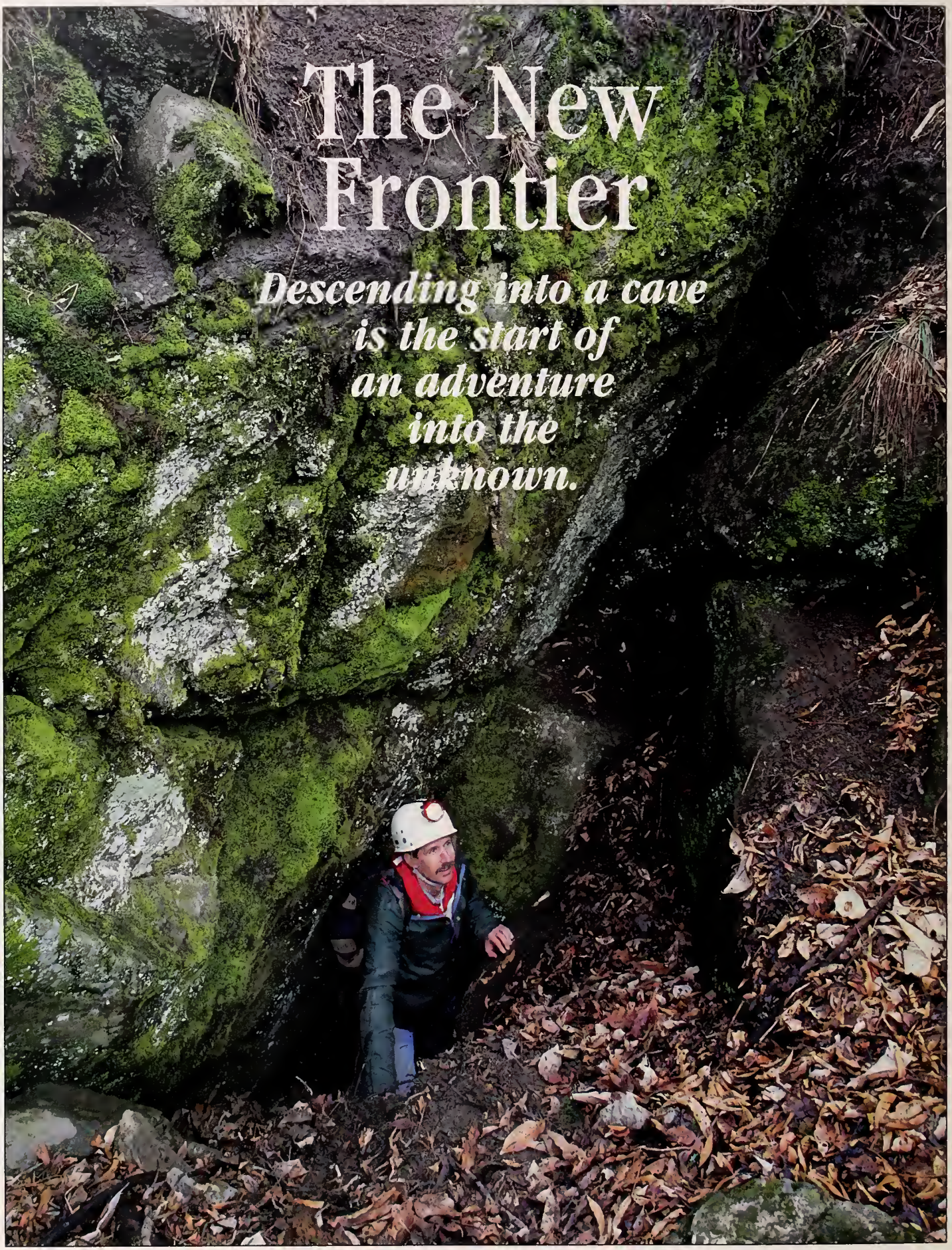


The New Frontier

Descending into a cave is the start of an adventure into the unknown.

by Lynda Richardson & Tim Wright

"Hey, guys...*Wait up!*" Icy winds screamed along the ridgetops and I strained to hear a response. Grumbling, I continued onward, carefully manuvering the rocky slope under the weight of a camera-laden pack. We had been hiking the steep ridges for nearly an hour. Biting winds blasted across the bare mountaintops, spraying us with a stinging rain. As I trudged onward, head bowed to the cold with visions of hot chocolate, a voice cried out and instinctively I hurried on. Pulling myself around a boulder, I faced the object of our search...a black hole in the side of a mountain, a passage to another dimension: a cave.

Expedition leader Rick Reynolds, biologist for the Virginia Department of Game and Inland Fisheries (VDGIF), and photographer/husband Tim Wright turned to greet me.

"Glad you could join us," Tim smiled. Ignoring him, I looked at the cave, pulling the pack from my shoulders.

"Coooool! What are you guys waiting for?" Outside the cave, our group of three donned hard plastic helmets to protect our heads from low ceilings and jagged rock, and helmet-mounted lamps which would provide illumination and keep our hands free. We packed a few backup flashlights...just in case. Gloves would guard hands from injury and would minimize damage to formations accidentally touched in the dark. Warm, comfortable clothes and hiking boots would protect us as we walked and crawled through dust, mud and sometimes icy waters of streams.

Geared up, we began our descent into the blackness, ancient dust rising beneath our feet and silence enveloping us. Reaching the entrance "room," we stood gazing around the void, eyes adjusting, helmet lamps throwing circles back and forth around the dark. Sometimes the lights stopped on various formations like stalactites, icicle-like projections of various sizes found hanging from the ceiling, or stalagmites, projectiles pointing up from the ground. Beads of silver flashed back at us as lights gazed over the damp ceiling. It was hard to believe that the entire scene before us was created maybe hundreds of thousands of years ago by something as simple as shiny water droplets.

Well, maybe not that simple. Actually, the whole thing really started four hundred million years ago when Virginia lay at the bottom of a shallow sea. Over the millenniums, countless sea creatures died and formed a thick sediment over the ocean floor. As time passed, the sea gave way to land and many of these sediments became limestone rock. Limestone, being non-porous, dissolves when exposed to an acid solution. When rain water soaks into the ground passing through soil and dead leaves, it becomes a weak form of carbonic acid. Seeping through the earth, it slowly dissolves the limestone in its path and eventually forms caves. The process continues today.

As the world evolved and limestone was molded and shaped, a new niche was created for developing species of animal life, and these animals took advantage of the environ-

***Opposite**: VDGIF biologist Rick Reynolds at the mouth of a cave. **Top**: State geologist Dave Hubbard admires a delicate cave formation known as "bacon." **Left:** Eastern pipistrelle bats in cave; photos by Lynda Richardson.*

ment provided by caves. As our group moved further into the darkness, we came upon several mounds of sticks and leaves. Closer inspection revealed circular entrance holes as big as my fist leading into immaculate nests of dried grasses. Rick explained that these were the work of Eastern woodrats, *Neotoma floridana magister*. Also known as pack rats, these curious creatures have the interesting habit of building elaborate nests using twigs, leaves, evergreen branches, feathers, bones, rocks, and any other materials they can find. They leave the cave at night and during foraging expeditions bring back decorations for the ole homestead. They particularly like shiny objects. "Be careful what you set down," Rick warned, "even for a minute. Woodrats have been known to swipe things right under people's noses. Hopefully, we'll get a chance to see one of them."

Whirling my light around the cave, I had other fuzzy mammals in mind and it wasn't a few steps further that my wish was granted. There, on the wall above our heads hung the lonely, brown shape of a bat.

"Eastern pipistrelle, *Pipistrellus subflavus*. There are several species of bats in this cave and that's probably the most common," Rick whispered. "Since all the bats are now in hibernation, we'll have to keep our voices low so as not to disturb them."

In winter, one must be particularly mindful of bats when entering caves. As the weather turns cold and insects die, the bat loses its only source of food. Because of this, it spends much of the fall building up fat reserves to carry it through its necessary winter slumber. During hibernation, bats hang from cave walls in a stupor; that is, their breathing and heart rate slows way down to conserve their fat reserves. If awakened prematurely, a bat may use up valuable energy and starve to death before the first insects emerge in the spring.

Quietly, we moved onward, crawling or walking deeper into the honeycomb passages of the cave. Thank goodness Rick knew the way, as I was so turned around that I argued with him and Tim about the direction of one passageway. Of course, they were right. But being stubborn, I ventured my own way in search of whatever was ahead. After a few minutes, I stopped and curled into a sitting position. In the blackness that surrounded me, only the distant sound of jeans scraping against dirt, echoing murmurs and a faint glancing spot of light were my company. I was alone...under-

ground... in a maze of chilled silence tooled by aeons. I thought about turning out my light just for fun. It was an electric light, so it was easy to turn on and off.

Cool air pressed against my face. My eyes worked hard to focus until I finally closed them. It was quiet now, except for an occasional drip of water somewhere in the distance. My nose tested the moist, yet dusty air as I tried to soak everything in... every sound...every smell.

It was hard to imagine animals living their entire lives in such a place. I guess that's what makes them so interesting. I thought back to another cave adventure. Dave Hubbard, a state geologist and member of the Virginia State Cave Board, had led a small group of us deep below the tourist trails of the commercially run Endless Caverns near Luray. The object of our search was found in the icy streams that ran through parts of its extensive cavern system. As Dave knelt on the stream bank, helmet light scanning the crystalline waters, the cry rang out, "Now THERE is a horse!" With a converted turkey baster, he excitedly sucked up his aquatic prey, the isopod *Caecidotea pricei*, the Price's isopod. His prisoner was a tiny, whitish, shrimp-like creature and at 3/4 of an inch in length, Dave's capture was indeed unusually large. After gently releasing the isopod into a holding dish, we gathered around to watch the energetic little creature paddle back and forth, investigating its new surroundings. Pretty daring for something without eyes.

Opening my eyes, I saw a light in the distance sweeping back and forth. Murmurs became words and I decided it was time to return to my expedition party. Switching on the lamp, I crawled back down the passage to meet fellow explorers just ahead. "Hey, you guys see anything?" I whispered upon reaching the men.

"Only bunches and bunches of bats," Tim reported with delight.

"Bats...just down there? Is it far? I'd love to see a bunch of them!"

"We really shouldn't disturb them anymore," cautioned Rick.

Gathering ourselves together, we scuffled and scraped our way slowly back along the inky passages. As we moved closer to the end of the trail, my eyes began to pick up light beyond that of my head lamp and the entrance room began to materialize between smoky rays of sun beaming down into the ancient cave. As we stood catching our breath before the ascent into a seeing world beyond, a sudden rush of leaves burst through the bright hole above. Thrashing through the rays of light, two small birds whirled in combat, crashing to the cave floor. As if realizing their folly, they stopped, flew for the opening and were gone. I wondered...when animals first crawled the Earth and caves were first formed, were there accidental moments like a battle between birds that first brought creatures into the caves? Was it an accident for us, too? Or was the draw of the unknown, the new frontier, too much for us to resist...even today?

*Caves are places where humans can explore "new frontiers" (**opposite:** photo by Tim Wright), but they are also special habitats where animals like the rare Price's isopod (**above**) exist. If herbicides or toxic wastes seep into the groundwater (**top**), highly sensitive creatures like isopods immediately disappear from caves. Thus, their presence in caves should be a cause for celebration, and their absence one of warning to us all. Photos by Lynda Richardson.*

Protecting the Resource...

As cave systems are discovered around the state, the Virginia Department of Game and Inland Fisheries' Nongame and Endangered Species Program is providing for the protection of these delicate ecosystems. Working in conjunction with the Virginia Cave Board and the Virginia Natural Heritage Program, such projects as the surveying of endangered bat populations, the protection of particularly sensitive caves by grating, working with landowners and local communities to solve cave related problems, and educational awareness programs are ongoing. But remember, it's your donations that make these valuable studies possible. This new frontier is waiting to be explored...Help us protect it. □

Lynda Richardson and Tim Wright are freelance writers/photographers living in Richmond.

A Rescue Mission For Wildlife

The Nuts and Bolts of Virginia's Nongame and Endangered Species Program

Peregrine falcon chick, only 20 days old, one of many recovering endangered species in Virginia; photo by Craig Koppie.

by Karen Terwilliger

What is the first thing you think of when someone asks you to name an endangered species? The African Elephant? The Black Rhino or Giant Panda? Or maybe closer to home, whooping cranes or wolves? Now, how about in your backyard, like the bald eagle, peregrine falcon or the bog turtle? Believe it or not, Virginia has 131 threatened and endangered species within its borders. You don't hear much about most of them, because they aren't cute and cuddly or majestic like our magnificent birds of prey. Instead, they inhabit obscure places unseen by most humans.

Why do we worry about them, then? Because any plant or animal that is endangered depends on a specific habitat, and is therefore telling us that the natural community it is a part of is in danger. Endangered species are, therefore, barometers or indicators of the health of their ecosystem. They are calling our attention to a symptom of the problem—the natural system upon which it depends has gone awry.

For example, if a variegate darter or Appalachian monkeyface mussel is in trouble, it could be telling us that the stream or river drainage in the mountains of Virginia is in trouble and that an investigation on the water quality or the area is in order. Or, if the Dismal Swamp shrew, canebrake rattlesnake and Virginia Eastern big-eared bat show declines, it tells us that the critical wetlands of Southeast are at risk. It's then our job to find the cause or causes of the problem and work to reverse them. Thus begins the challenge.

Endangered species therefore, are a visible symptom of the problem. For the most part, habitat loss and quality is the problem. We all know that treating symptoms rather than the problem is neither time nor cost-effective. What we are challenged with is not just the management of a wildlife population, but also the conservation of its habitat.

This is a job (for Superman!) that can't be accomplished by one person or program or agency. It requires a network of partnerships between local, federal, state governments, and with the private sector: corporations, conservation groups and private landowners alike. That is the approach that Virginia Department of Game and Inland Fisheries' Nongame and Endangered Wildlife Program has taken. With limited resources and personnel, it only makes sense to set your program priorities, identify all the players who can help, and make best use of every partner's resources—getting the most for everyone's money.

Here's how it works. First we identify which species are in most

need of our attention. This monumental effort was accomplished with the help of over 200 experts who convened at a symposium in 1989 and later published their information as a book in 1992, entitled *Virginia's Endangered Species*. For each threatened and endangered species, a recovery plan has been (or is being, in the case of newly listed species) developed and includes a prioritized description of the conservation actions necessary to recover their populations. Wherever feasible, these recovery plans have been designed for a group of species with similar needs; for example, a number of the mussels of western Virginia streams were addressed together in one plan.

The first step in most conservation and recovery efforts is to accurately determine and monitor a species distribution and population status. Where is it and are there still as many as there were when we last checked? This is usually accomplished through surveys by staff biologists or contracted experts.

Next, we determine the cause of the decline, if possible. Habitat loss or degradation is usually the culprit. In this case, we muster the assistance of appropriate partners with mutual

The red-backed salamander is a widely distributed species throughout Virginia that seems to be in no danger of survival. However, VDGIF is working to protect not only those species in danger, but those with healthy populations--to make sure they stay healthy tomorrow; photo by Gary Sargent.

goals and use one of many land conservation tools. In some instances, as with bald eagles, piping plovers, least terns, black skimmers, and big-eared bats, management plans and agreements with landowners are very effective protection tools.

Conservation easements have worked well in other situations where the landowners agreed to protection in perpetuity. Outright acquisition is always an option and is usually accomplished through both private conservation organizations (such as The Nature Conservancy or Trust for Public Land) and federal and state agencies.

If a factor other than habitat is the problem, then research is often needed to determine appropriate management strategies. Some factors that we have been able to successfully determine as limiting to the species are: chemical contaminants, water quality, acid rain, predation, and human disturbance. Each of these must be addressed from the approach that best meets the needs of that particular species, parcel of land, and landowner.

Other essential parts of our rare fish wildlife conservation program are education and enforcement. Without the understanding and support of the public, these species and the landscape of Virginia has little chance of being restored or maintained. The Virginia Department of Game and Inland Fisheries has a strong environmental education program and has now reached almost every school in Virginia with its Project WILD K-12 curriculum. Enforcement of laws and regulations protecting these species and their habitats is a critical role played by our game wardens. In very few instances, however, has enforcement been needed, as our environmental review process and landowner relations programs work effectively early on.

With all this talk lately of endangered species conflicts, we are pleased to state that in Virginia, almost every landowner and agency we have worked with has been most receptive and cooperative in taking their conservation responsiblities seriously.

That's the nuts and bolts of our program, and the rest of the articles in this section should provide more detailed examples of our intensive efforts for rare, threatened and endangered species conservation. □

Karen Terwilliger is a wildlife biologist with VDGIF who jointly supervises Virginia's Nongame and Endangered Species Program.

Karen Terwilliger; photo by Lee Walker

The health of our natural environment is very important to me. As I was growing up, my family spent a great deal of time outdoors. We hiked and drank clean, clear water from the streams. We dined on fresh fish caught from a nearby lake and served many other different kinds of wild game, vegetables and fruit. We spent many a day birdwatching and frog watching and many a night watching raccoon, skunk, possum, fox, and deer cross our lighted yard. That is how I developed my deep appreciation for nature, and I believe that everyone should have that same opportunity to discover and enjoy their natural surroundings.

The changes I have witnessed in the last decade have strengthened my commitment even more. It is a very different world that our children must face now. As Virginia has become more urbanized, especially around the Chesapeake Bay, we have lost or damaged our globally important wetlands, shellfish and finfish populations, and the wildlife that depend upon them. We have stressed our coastal ecosystem and its water quality and the many animals and plants that are supported by these habitats. We have also left our mark on the piedmont and mountains, changing the capacity of our lands and water to support these natural communities.

A commonsense responsibility to stewardship will be critical to Virginia's future. In order to maintain our quality of life, each of us must take responsibility for our actions and develop a caretaker attitude toward our environment.

Virginia and its natural communities truly do belong to our future generations. What we do in our short time here will influence our quality of life, the numbers and kinds of animals and plants we see, and our opportunity to enjoy them. I want future generations to be able to realize and experience firsthand their link to the natural world. *—Karen Terwilliger* □

*Two rare Virginia species from the mountains and the coast: the mountain-dwelling Peaks of Otter salamander (**top**; photo by Lynda Richardson) and the beach-nesting piping plover (**above**; photo by Rob & Melissa Simpson).*

Endangered Species in Virginia: The Balance Sheet

Focus on: Fish, Amphibians, Reptiles & Mollusks

by Sue Bruenderman

The Aquatic Nongame Program, working out of the Fisheries Division, has been in existence now for two years, and a great number of accomplishments have been made in a short period of time. Many days (and sometimes nights!) were spent by upper-level Fisheries Division staff in developing nongame regulations to protect native wildlife throughout the state. Numerous research projects now are underway through contracts with experts in the fields of ichthyology (fish), herpetology (amphibians and reptiles) and malacology (mollusks). Additionally, the staff has been busy in the field gathering important data on populations of aquatic threatened and endangered species, such as the Roanoke logperch and blackbanded sunfish. Highlighted below are some of the activities being accomplished in the aquatic arena, made possible through generous contributions to Virginia's Nongame and Endangered Species Fund.

The federally endangered Roanoke logperch is found only in the Roanoke and Chowan river drainages, where it is nearly always rare or uncommon. Two studies sponsored by the VDGIF's Nongame and Endangered Species program are ongoing to protect this tiny fish; photo by Sue Bruenderman.

Bog Turtle Inventory

The bog turtle, *Clemmys muhlenbergii*, is a small secretive turtle of sedge meadows, seeps, and marshes. This reptile species was officially listed as endangered in 1987, primarily because of the alteration and loss of its habitat, and from overcollecting for the pet trade. This species is rare throughout North America, and experts speculate that the Virginia population represents the stronghold for the species on a global scale. Prior to 1991, there had been no systematic, rangewide inventory for bog turtles in Virginia. In order to protect and manage this important population of bog turtles, we needed more detailed information about the actual range and locations of this species in the Commonwealth.

In 1991, funding became available to the Department of Game and Inland Fisheries (VDGIF) through Section 6 of the Endangered Species Act for bog turtle research. VDGIF entered into a contract with the Department of Conservation and Recreation's Division of Natural Heritage (DNH), and Kurt Buhlmann, an expert herpetologist on their staff, conducted a bog turtle survey in the southern Blue Ridge Plateau in Virginia, the region of the state from which they are historically known.

The study involved a thorough review of the literature, rigorous map work to identify both known and potential new locations, and finally, a field survey to determine if Kurt's speculations about potentially inhabited areas proved correct. Water-filled puddles, cow prints, sphagnum tussocks, and shallow rivulets were carefully inspected from May through August of 1991. As a result of the survey, a total of 14 new bog turtle sites were discovered, with evidence of reproduction occurring at a few of them.

Although this generally is good news, the down side is that imminent threats to a number of these subpopulations were identified as well. Threats included excessive cattle grazing, ditching of wetland seeps,

The state endangered bog turtle is found in Virginia only in Carroll, Floyd, and Grayson Counties, where it is suffering from alteration and loss of habitat and overcollecting from the pet trade. Rare throughout its range, experts speculate that the Virginia population may be the stronghold for the species on a global scale. We are now putting protection and recovery plans for the turtle into action; photo by Bill Lea.

and the proposed widening of a major highway in southwest Virginia; all of which can destroy quality bog turtle habitat or cause direct mortalities.

Recommendations for protection and management were made at each of the 14 new bog turtle sites, and now it is time to put these into action. Bog turtles require forested stream corridors to disperse and ensure continued mixing of genetic material throughout the population. Unfortunately, numerous bog turtle sites presently are isolated. Future plans include identifying dispersal corridors for this endangered turtle species. Other protection efforts will include determining the population size and age-class structure at each of the sites, and educating the landowners on whose property many of these turtles are surviving. A number of property owners were surprised to find out about the existence of these rare creatures on their land, even though they had co-existed with the turtles all of their lives!

VDGIF law enforcement officers will play a crucial role by protecting these animals from poaching by the pet trade as well. In progress is an experiment spearheaded by DNH and Dr. Joseph Mitchell of the University of Richmond on National Park Service land, in which horse grazing is being ceased and wetland habitat of a known bog turtle site is being restored. Monitoring of this site over the next several years will determine the effectiveness of this management prescription, with implications for other important bog turtle sites in Virginia.

Recovery Plans for Fish, Mussels, Reptiles and Amphibians

The number of animals in Virginia that are threatened or endangered with extinction continues to grow, and it has become a priority of VDGIF to develop conservation strategies for these officially protected species. In 1992, we entered into two separate contracts to develop recovery plans for all state endangered fish (5 species) and mussels (13 species), and for 8 species of threatened and endangered amphibian and reptile species.

Roy Smogor, an ichthyologist with the Fisheries Cooperative Research Unit at Virginia Tech, is leading the effort for the fish and mussel species, while Dr. Joseph Mitchell, a professional herpetologist affiliated with the University of Richmond, is drafting the plans for the reptiles and amphibians. These plans are patterned after those prepared for the federally listed species, but will identify specific recovery measures to be taken within the confines of Virginia's borders.

Accomplishments thus far include the development of template plans for the fish and mussel species, and the establishment of recovery teams for the amphibian and reptile species plans. Recovery teams eventually will be established for all species. These teams will meet and determine the best and most practical means of protecting these species, with the ultimate goal of eliminating enough of the threats, and re-establishing their populations to a level where it is possible to remove these animals from the state list of threatened and endangered species.

The state endangered canebrake rattlesnake is rapidly losing its chances for survival in the state, largely because its habitat is being lost to urban development. Two projects to gather more information about the snake have been initiated to help us protect its remaining numbers in Virginia; photo by Rob Simpson.

Canebrake Rattlesnake Survey and Life History Research

Officially listed as a state endangered species on January 1, 1992, the canebrake rattlesnake, *Crotalus horridus*, is rapidly losing its chances for survival in the state. Restricted to southeastern Virginia, the primary threat to this important predator is loss of habitat due to urbanization. Scientists speculate that by the year 2000, the canebrake rattlesnake will dwindle in size to only four, small, isolated populations in the vicinity of the Great Dismal Swamp National Wildlife Refuge.

In 1992, two projects to study the canebrake rattlesnake were initiated, funded by generous contributions received through Virginia's Nongame Tax Checkoff program. Dr.

Joseph C. Mitchell currently is involved in a survey to determine the status of sites historically inhabited by canebrake rattlesnakes. To date, approximately half of all the sites for which there are records have been surveyed, including those in the cities of Virginia Beach and Chesapeake. As judged by the survey thus far, the following pattern is emerging: all sites occupied by canebrake rattlesnakes in the 1950's and 1960's no longer exist—they now are paved with concrete.

The second component of the studies being coordinated by the Aquatic Nongame Program is a radio telemetry study being conducted by Drs. Alan and Barbara Savitzky, researchers with Old Dominion University in Norfolk, Virginia. During the fall of 1992, the Savitzkys successfully implanted four snakes with radio transmitters, enabling these scientists to collect a substantial amount of information in a very short period of time. By tracking the snakes between 5 to 7 days a week during a two-month period, the Savitzkys have discovered areas used by the snakes for hibernation purposes.

We know now that tree root holes leftover from rotten tree bases are typically used, and that these rattlers will move back and forth between holes (sometimes shared by cottonmouths!). Detailed habitat requirements (soil, body and air temperatures) of this snake species also are being defined. There are good indications that these snakes feed on small mammals and rodents. Most important to the conservation of this important predator species, however, has been the determination that this animal will travel distances of up to 3/4 mile in length (or possibly more).

With this information in hand, managers can better protect this species from future declines. With only two months of data in our hands, already we can better protect this endangered species by informing project developers about the snake's movement patterns and habitat requirements known to date during the planning stages of their construction.

Hopefully, nongame funding levels in the years to come will enable continued support of these projects, so that we can accurately determine space requirements, identify viable (reproducing) populations, and hopefully, purchase several critical sites to ensure the continued existence of the canebrake rattlesnake in Virginia.

Aquatic Conservation Efforts in Southwest Virginia

Unbeknownst to many Virginians, the watershed and associated waters of the Clinch, Powell and Holston Rivers of southwest Virginia support one of the richest fish faunas in North America, and one of the most diverse freshwater mussel faunas in the world. However, over the past 50 years, we have seen a steady decline of species in this diverse assemblage of animals, caused primarily by water pollution, habitat alteration and degradation. Once considered common, 32 species of freshwater mussels and 13 species of fish now are listed as endangered or threatened at the state or federal level in these rivers in Virginia. By focusing our attention on this incomparable region of the state, VDGIF's Aquatic Nongame Program is carrying out our agency's mission—to provide for optimum populations and diversity of all species to serve the needs of the Commonwealth.

Copper Creek

Copper Creek, a major tributary of the Clinch River in southwest Virginia, has been of great interest to biologists for decades because of its incredibly rich fish fauna. A total of 71 species live in this one stream, more than have been recorded from any other tributary of a large river in Virginia. Numerous rare species of mussels, fish, amphibians, reptiles and bats depend on Copper Creek or its riparian corridor for their existence, including 12 species which are either endangered or threatened or are soon to be added to the list of officially protected species.

During the past two years, nongame fisheries biologists have been monitoring the mussel fauna of Copper Creek, with disturbing results. Freshwater mussel populations in this unique stream appear to have declined substantially since 12 years ago when Tennessee Valley

Copper Creek, a major tributary of the Clinch River, is known for its rare species of mussels, fish, amphibians, reptiles, and bats that depend on the watershed and its corridor for their existence. Unfortunately, sedimentation from crop and pasturelands and pollution from livestock and agriculture are doing alarming damage to the tributary; photo by Sue Bruenderman.

Authority biologists conducted surveys, and this is a bad sign for the rest of the ecosystem. Freshwater mussles are excellent indicators of stream health, and typically are the first animals to show declines in polluted waters. The reason? Because they are long-lived sedentary bottom-dwellers which accumulate contaminants in their shells and soft tissues. Many species in Virginia survive to be 50 years old! Numerous attempts by biologists during the past four years to find the federally endangered yellowfin madtom in Copper Creek also has biologists concerned, because this is the last stream in Virginia where this catfish species can be found. Our observations indicated that something seriously wrong has been happening within the Copper Creek watershed, and we were determined to get to the root of the problem.

In 1992, VDGIF biologists conducted a riparian corridor investigation by canoe, to document land-use practices along Copper Creek. We were delighted by the many beautiful reaches still remaining within the 15-mile stretch that we floated, but were concerned by the amount of erosion along the riparian corridor and numbers of free roaming cattle in and along the stream. To follow were numerous phone calls to the Soil Conservation Service, and other federal, state, local and private organizations who historically and currently have been active within the watershed. Fish and mussel experts who have studied the stream also were consulted. The data from the many groups and individuals that we consulted were in agreement with our own. The consensus was that water quality in the Copper Creek watershed is being degraded, and that nonpoint source pollution (most notably soil loss and resultant sedimentation from crop and pasturelands, and excessive nutrient loading from livestock and agricultural production) is the primary problem.

So what is to be done? Shouldn't the people along Copper Creek be made aware of what is happening to their water supply, to their natural inheritance? Yes, they should, and here is what is blossoming as a result of VDGIF's efforts:

Southwest Virginia Outreach Program

Working together with Dr. Diana Weigmann and John Flynn from the Virginia Water Resources Research Center at Virginia Tech (VWRRC), we have inititated the Southwest Virginia Outreach Program, a multi-organizational initiative to address nonpoint source pollution in the Upper Tennessee River drainage in Virginia. By uniting and encouraging cooperation between landholders and natural resource organizations, we hope to make long-term improvements in water quality, and to restore and protect aquatic, riparian and wetland habitats and associated fish and wildlife and plant species.

The Outreach Program begins with the production of publications

to address nonpoint source pollution on private lands, on a watershed-specific basis. These materials will explain how each private citizen fits into the ecosystem, demonstrating the effects that can result (both positive and negative) from an individual's activities within a watershed. The publications will synthesize information from all organizations working to conserve a particular watershed, providing information on all available sources of technical and financial assistance for private landholders interested in implementing conservation practices on their own properties. Targeted for individual watersheds, with information relevant to their own lives and property, it is expected that these publications will be meaningful to landowners and will encourage citizen action.

The publications are the first step of the program, acting as the catalyst for other outreach activities. Other program elements include roundtable meetings between landowners and natural resource agencies, synthesis of educational packages for teachers and individuals, (videos, slide shows), establishment of an information clearinghouse and citizen monitoring groups to serve as watchdogs to notify officials of observed problems. This outreach effort also actively supports landowner assistance programs offered by many organizations, such as the Resource Conservation and Development Program of the U. S. Soil and Conservation Service (SCS); the Private Lands Program of the U. S. Fish and Wildlife Service (USFWS), which includes riparian restoration projects jointly operated with The Nature Conservancy (TNC); and the Forestry Stewardship Program made available through the Virginia Department of Forestry. The Southwest Virginia Outreach Program is designed specifically to help these groups identify private landowners who may be interested in initiating restoration and wise-use conservation activities on their own properties.

*The watersheds of the Clinch, Powell and Holston Rivers of southwest Virginia support one of the most diverse freshwater mussel faunas in the world (**opposite:** a selection of Copper Creek mussels; photo by Sue Bruenderman. **Below right**: The Nature Conservancy's Pendleton Island on the Clinch River; photo by Bill Kittrell).*
*Habitat alteration and degradation and water pollution are threatening this rich diversity of life, however. In addition, the exotic zebra mussel (**right**; photo by Soc Clay) threatens to destroy our native mussel populations if it reaches Virginia waters.*

Approximately 29 natural resource agencies, including VDGIF, SCS, the USFWS, TNC, Tennessee Valley Authority, the Virginia Department of Forestry, Virginia Water Control Board and the U.S. Forest Service, are involved in the Outreach Program, providing professional expertise into the publications and outreach efforts. By taking this coordinated and localized approach we hope to foster the long-term commitment of the private landowner to improve and protect water quality and associated biota within their very own watersheds.

Copper Creek, Wallen Creek, and Big Moccasin Creek are the streams targeted for initial outreach efforts. If successful, the Southwest Virginia Outreach Program will expand to additional watersheds within the Upper Tennessee River Basin, and hopefully will serve as a model for other water-related outreach efforts throughout the Commonwealth.

Tributary Search for Mussels

The freshwater mussel fauna of the upper Tennessee system in Virginia has been extensively surveyed, with many historic records for Vir-

ginia dating back to the early 1900s. An energetic malacologist by the name of A.E. Ortmann combed through the state during these early years, and efforts to understand these strange organisms continued through the decades to the present. However, collections apparently have been focused on the main stems of the major rivers, and because of the many species currently in decline, interest has been growing among malacologists regarding the possibility of undiscovered populations of mussels residing within tributaries of larger rivers.

In 1992, fisheries biologist Mark Ferguson surveyed selected tributaries of the Clinch, Powell and Holston Rivers to assess habitat quality and suitability of these streams for freshwater mussels. Data were collected at each site regarding stream size, habitat quality, substrata composition, land use practices, and evidence of any fish or mussel species present. Stream banks, shallow areas and gravel bars were searched for mussel shells, and all sites visited were documented with photographs. Mark investigated a total of 55 tributary streams during the course of the survey. Shells of six species of mussels were found in 9 of the tributaries surveyed, including the Tennessee pigtoe, which is a species of special concern in Virginia.

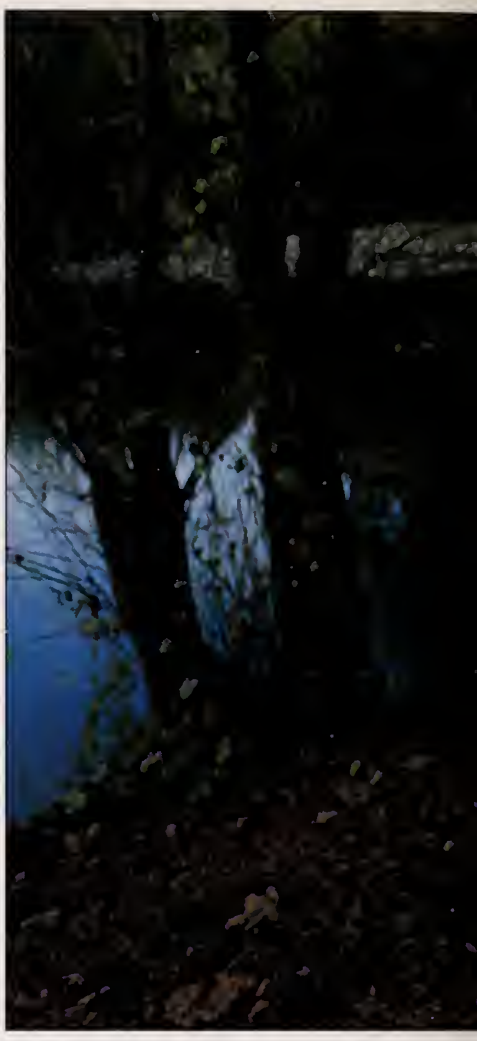
Results of Mark's hard work indicate that at least 15 of these tributaries warrant further investigation. Aquatic habitat was of good quality, and we are encouraged at the prospect of finding viable, healthy populations at these 15 sites. Our next objective in this venture will be to revisit these targeted streams, and with snorkeling gear in hand (the best way to sample for mussels!), conduct more rigorous assessments. We are excited by the possibility that out there somewhere, hiding in undiscovered waters, are more populations of some of the rarest species in Virginia.

Stream Research in Southwestern Virginia

Through a cooperative agreement between VDGIF, the U.S. Fish and Wildlife Service and Virginia Tech, annual funding is provided to the Virginia Cooperative Fish and Wildlife Research Unit at Virginia Tech to conduct surveys and research on the rare and endangered aquatic fauna of southwest Virginia streams. Projects throughout the years have focused on the distribution, status, life history, and conservation of fish and mussel species. Results produced by the Cooperative Unit have been an invaluable source of information for state and federal managers who are trying to manage and protect the aquatic animals in the Commonwealth.

Unit Leader Dr. Richard Neves, Assistant Leader Dr. Paul Angermeier and their students currently are involved in numerous projects to hopefully identify causes for widespread declines and evaluate techniques for recovering species in the Clinch and Powell Rivers. Dr. Neves' current research projects include the following topics: cryopreservation (similar to freeze-drying) of the early life stages of critically endangered mussel species; identification of contaminants in river water and sediments which are toxic to aquatic life; translocations of adult mussels to reestablish populations that have disappeared from Virginia's waters; life history studies of endangered mussels; the culture of juvenile freshwater mussels for recovering rare and endangered species; and potential use of farm ponds for refugia for riverine mollusk species threatened by zebra mussels once they reach Virginia.

Dr. Angermeier's expertise involves the ecology of native stream fishes, having dedicated numerous years to help develop and test a technique to monitor streams called Karr's Index of Biotic Integrity (IBI). This biological monitoring tool uses fish and invertebrate communities to assess environmental quality. Dr. Angermeier and his fisheries staff are in the analysis stage of testing the effectiveness of the IBI at 36 sites in the Clinch River drainage. Final products of the IBI study will be a drainage "map" of stream quality, which will aid managers in focusing protection and restoration efforts,



and hopefully, a new tool for recovering endangered species in this and other rivers in the Tennessee River drainage.

Research projects directed by Dr. Angermeier which are in progress include two studies having direct recovery implications for the federally endangered Roanoke logperch in Virginia. The first involves the potential use of a closely related and more abundant species (the blotchside logperch) to better understand the needs of its endangered cousin. The second study is an effort to determine how and if the Roanoke logperch population in the South Fork Roanoke River can successfully recolonize the river following the fish kill of September 1991.

Results of the many ongoing projects at the Cooperative Unit are forthcoming, and will be presented in more detail in a future issue of *Virginia Wildlife*. □

VDGIF aquatic nongame biologist Sue Bruenderman; photo by Tim Wright.

"Never Say Never"

A personal essay by Sue Bruenderman

Managing endangered species is the most challenging job I have ever had. Perhaps the most enjoyable facet of my work is when I get the chance to get out into the field, into the animal's natural environment to observe closeup and firsthand the animals that I am working and fighting for each day in the office. Even that is a difficult task, however, because sometimes the animals are so rare that you may search a whole day (often more) before you find what you are looking for. For instance, when I am searching a stretch of a river for endangered freshwater mussels, it isn't unusual to spend eight hours in the water (and looking like a prune by the end of the day), just to end up with perhaps only one or two animals of a species that at one time was very common in the area. But, it is rewarding to finally find that little animal; it's like looking for a needle in a haystack, or working a jigsaw puzzle, searching for that one exact piece that will fit that one spot.

However, for every enjoyable moment observing rare creatures, an endangered species biologist spends three times as much time trying to save them from extinction. Roads, bridges, concrete, shopping malls... endangered species face these problems every day. More and more people are desiring more and more space. Land is being cleared at an alarming rate, and unfortunately, the animals have no voices to cry out, to say "Stop! We live here!" Their habitat—the trees, the rocky, pebbly bottoms of rivers, the ponds, pools and marshes—is being lost, more often than not with no hope of being recovered.

There is a lot of pressure associated with being an endangered species biologist. We spend many hours reviewing projects, trying to find a way to say "O.K." to a proposed development while still managing to protect an endangered species. Sometimes it is a very difficult decision, because it brings the desires and needs of human beings into direct conflict with the conservation of an endangered species. We often look like the bad guys, yet what we are trying to do is preserve the quality of our world for our children—your children. We are trying to ensure that they have a lot of different animals to look at, to search for, to find and say "oooh neat!" about. What we strive for—what all endangered species biologists wish for—is that your kids will be able to look out your window and see not only robins, but goldfinches, and red tanagers, bluebirds and chickadees, titmice and black and white warblers and grosbeaks. And song sparrows and bald eagles and cardinals, and Bewick's wrens and loggerhead shrikes and red-cockaded woodpeckers, and piping plovers and roseate terns, and the list goes on and on.

An endangered species biologist is the eternal optimist. We don't believe in "no" or "can't." We believe that endangered animals can make a comeback, and in particular, we have faith in human beings, who ultimately determine whether or not they do. □

Sue Bruenderman is the aquatic nongame biologist for VDGIF. Sue coordinates and directs the conservation efforts concerning endangered fish, amphibians, reptiles and invertebrates.

Unearthing Treasures:

The Quest to Find Out More About Virginia's Amphibians and Reptiles

by Joseph C. Mitchell

Amphibians and reptiles often get a bum rap. They are hacked to death, squashed by cars, shot, gigged and poisoned. Although many people treat amphibians and reptiles with a disdain born of all sorts of misconceptions, these animals are among the most important links in food webs and are essential to maintaining healthy ecosystems.

For example, some species of salamanders are so abundant in some parts of the Eastern deciduous forests that their combined body weight is greater than that of all the mammals and resident birds of the area. These amphibians eat smaller animals and are, in turn, energy packets for larger predators. Thus, one can see how salamanders provide a powerful link that maintains the strength and health of our ecosystems. Similar things could be said for our terrestrial snakes, aquatic turtles and tadpoles.

Despite their importance, however, until 20 years ago, no comprehensive inventory and distribution of the reptiles and amphibians of Virginia had been tackled. In 1973, realizing the absence of such valuable information, I started what I like to call the "Virginia Herpetology Project" to identify these invaluable "missing links" in our knowledge. In 1979, doctoral student Chris Pague joined me on the project. For the next 10 years, we struggled with the project, pursuing our dream out of our own pockets, scraping together help and supplies wherever we could.

In 1983, one might say we and the reptile and amphibians of Virginia were blessed with a small miracle. The newly formed Virginia Nongame Program of the Virginia Department of Game and Inland Fisheries provided funds for the next seven years of our research. With this help, we have been able to accumulate accurate distributional records for all the state's amphibians and reptiles, record data on aspects of their reproductive biology and ecology, and schedule the publication of a book summarizing all available information on these animals.

As a result of this study, we now know there are 134 species of amphibians and reptiles in Virginia. Before the study, our checklist totaled 129. Between 1979 and 1982 while working on the project, we discovered three species that had never been found in Virginia before, Mabee's salamander *(Ambystoma mabeei)*, the mole salamander *(Ambystoma talpoideum)*, and the Eastern glass lizard *(Ophisaurus ventralis)*. After receiving support from the Nongame Fund, two additional species and one subspecies were added to the checklist: the striped mud turtle *(Kinosternon baurii)*, lesser siren *(Siren intermedia)*, and hieroglyphic river cooter *(Pseudemys concinna hieroglyphica)*.

Several other species had been reported previously from Virginia but had never been confirmed. Nongame support allowed us to ver-

ify that the Florida cooter *(Pseudemys floridana)*, stripe-necked musk turtle *(Kinosternon minor peltifer)*, the Cumberland slider *(Trachemys scripta troostii)*, and the mountain earth snake *(Virginia valeriae pulchra)* do actually occur in the Commonwealth. These recent discoveries substantially increased our understanding of the range of amphibian and reptile diversity in Virginia. Yet there may be several other species that lie undiscovered within the state's boundaries. Knowing which species we have is the first step in managing and protecting Virginia's biodiversity.

As it has turned out, there have been more benefits derived from this project than we ever imagined in the beginning. Let me review a few of them.

We often take for granted such basic information as knowing where each species occurs in Virginia. Distributional data tell us a lot about a species, like whether it is adapted to cool mountain climates or warm Southeastern coastal systems, and whether it is found over large areas or is restricted to small areas. For example, the black rat snake *(Elaphe obsoleta)* is found throughout the Commonwealth, while the glossy crayfish snake *(Regina rigida)* is restricted to a tributary of the Chickahominy River. What if a large urban project was slated for that tributary? How would we know if one of our native species would be affected? Like many agencies, the Department of Game and Inland Fisheries reviews environmental impact statements. The mountains of data we accumulated on amphibian and reptile distribution records, like those for the two snakes, allow this agency to comment accurately on which amphibians and reptiles may be affected by this or that project. If warranted, the project may be modified to keep from harming those species.

One of the most important benefits to be derived from distribution records on amphibians and reptiles is knowing what species are threatened by extinction. Species which have been found in many locations are not likely to be in danger of extinction, but species found in only a few places may very well be.

The canebrake rattlesnake *(Crotalus horridus atricaudatus)*, the strikingly handsome, lowland counterpart of the timber rattlesnake, had historically been found in many places in southeastern Virginia. But habitat loss from urbanization in recent decades caused population declines and reduced the number of places this species now occurs. The information on past and present distributions, along with projected rates of urban development, caused us to recommend the canebrake for endangered status. It is now on the state endangered list.

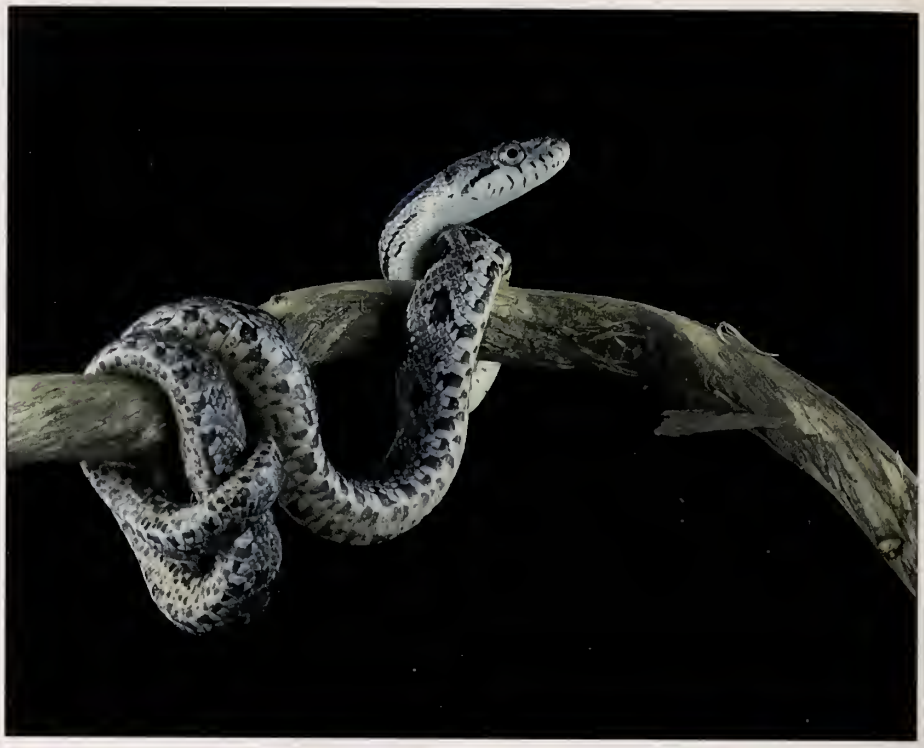
Nongame-sponsored research on the distributions of and threats to the bog turtle *(Clemmys muhlenbergii)*, eastern chicken turtle

Opposite: *Gray treefrog; photo by Lynda Richardson.* ***This page:*** *Many people would not know that such rare animals as the glossy crayfish snake* ***(above, far right****; photo by Lynda Richardson), the eastern chicken turtle* ***(far right****; photo by Lynda Richardson) or the barking treefrog* ***(right****; photo by Joe Mitchell) exist today in Virginia, but herpetologists like Dr. Joe Mitchell and Chris Pague* ***(pictured above****; photo by Joe Mitchell) make it their business to unearth (literally, sometimes) the rare and secretive wildlife that make up such an integral and wonderful part of our environment—in order to help them survive.*

(Deirochelys reticularia), barking treefrog *(Hyla gratiosa)*, Mabee's salamander, and the eastern glass lizard, to name a few, resulted in their legal protection as well.

At this point you're probably wondering how one gets this kind of information on amphibians and reptiles. "When I go into into the woods, I never see a thing," you might say. Herpetologists must work hard to find these animals. We are sometimes lucky to find them out where we can just pick them up. The eastern box turtle *(Terrapene carolina)* is a good example of a species we find most often by just looking in the woods. But, most of the time we have to work hard to find them in their hiding places, or we have to use traps to catch them when they are active.

The standard way herpetologists work is to walk through a habitat and turn over logs, rocks, and other objects on the ground. Ring-necked snakes *(Diadophis punctatus)*, black rats *(Elaphe obsoleta)*, copperheads *(Agkistrodon contortrix)*, and red-backed salamanders *(Plethodon cinereus)* may be found this way. We turn over rocks in streams for dusky salamanders *(Desmognathus fuscus)* and two-lined salamanders *(Eurycea bislineata)*, and dip in ponds and water-filled tire ruts for tadpoles and salamander larvae. Hand-collecting requires a lot of time if the goal is to determine what species are present in a given area. This is because many species are active only during certain times of the year and even then only under specific environmental conditions.



*The Mabee's salamander (**pictured above**; photo by Lynda Richardson) is one of five recently discovered species in VA. Some may wonder how one goes about finding rare or even common reptiles and amphibians. One method is to set up a drift fence (**opposite, top right;** photo by Lynda Richardson) for salamanders and frogs. Fish traps (like the one **pictured opposite, bottom right**; photo by Joe Mitchell) are effective for large turtles, including the eastern spiny softshell (**opposite right**; photo by Rob Simpson) while smaller turtles like the painted (**above, far right**; photo by Gary Sargent) can be caught in another type of fish trap. Turning over logs and rocks may turn up black rat snakes (**top**; photo by Lynda Richardson) or the rare Cow Knob salamander (**above right**; photo by Lynda Richardson).*

We often have to resort to specific methods to obtain some species. Gray treefrogs *(Hyla versicolor* and *Hyla chrysoscelis)*, for instance, are best sought when males are calling at breeding sites. That means driving around at night until you find a chorus, then wading into the pond or swamp with a headlight to search for the frogs. If you are lucky, you catch a few by hand. Some species of frogs, like bullfrogs *(Rana catesbeiana)* are easily detected, but others, like narrow-mouthed toads *(Gastrophryne carolinensis)*, are very secretive. Lots of effort is required to find them in their hiding places.

Many amphibians and reptiles, "herps" for short, are active only during certain portions of the day or night. Many herps can be found by driving slowly on rural roads at night and keeping a watchful eye for the right shape or movement. We have obtained many specimens this way, although many of these, especially snakes, have been found dead on the road (DOR). For some species, the number of DOR snakes from which we have obtained information outnumbers those we have found alive. Unfortunately, many beneficial black rat snakes and box turtles are killed on our roads every year.

I have studied freshwater turtles in many places in Virginia using several types of traps. These traps are made of chicken wire or netting attached to hoops so that one or two

funnels allow turtles to enter the trap, while making it hard for them to escape. The trap is placed in shallow water with the top exposed, allowing the turtles to reach air. This style is effective for painted turtles *(Chrysemys picta)* and stinkpots *(Sternotherus odoratus)*.

I have been fortunate to work with several fisheries biologists who have helped to trap turtles with their fish traps. Fish traps, made like hoop net traps but with a lead net attached to the front, are effective for large freshwater turtles like snappers *(Chelydra serpentina)* and yellow-bellied sliders *(Trachemys scripta)*.

A trapping technique gaining popularity for use in terrestrial habitats is the drift fence with pitfall traps. Many animals, like marbled salamanders *(Ambystoma opacum)* and southern leopard frogs *(Rana utricularia)*, walk or run across the forest floor. By intercepting them

with a fence made of aluminum flashing and diverting them to either side, we can direct them to a pitfall trap, a container sunk in the ground so that the top is flush with the ground surface. Pitfalls are checked frequently and animals that do not climb or jump out are identified, measured, and released.

The captures from such an array of techniques provide estimates of the relative abundance of many species in the habitat. These data allow comparisons of herp communities in different habitats and tell us which habitats each species prefers the most.

The amphibians and reptiles we have captured with these methods, often with Nongame Program support, provided much new information about their biology. How many

eggs or babies does it have? When do females lay or bear them? How long do they live? What do they eat? What eats them? Are females bigger than males, or vice versa? What habitats are preferred? These are a few of the basic questions that have been answered for some of our species.

Why is this information important? Many management tools used to help animal populations require information on number of young, survivorship, prey, predators, and habitats. Much of this crucial information was simply not available for amphibians and reptiles a decade ago. Without active management, some of Virginia's species may decline to the point of no return in the next several decades. Such reproductive and ecological information is needed on all species so that we can understand how they function in the places they live.

The Department of Game and Inland Fisheries has been using the information accumulated from the Nongame projects on amphibians and reptiles for various purposes. Yet this information belongs to the public. The forthcoming book and other publications, like the articles I have written for *Virginia Wildlife*, serve to fill an information void and help educate people about these much misunderstood animals.

The spotted turtle (photo by Kurt A. Buhlmann) is just one of 134 species of amphibians and reptiles in Virginia. Although not in trouble today, species like this turtle could be endangered within a few years. We have far too little information on the reproduction and population structures of our reptiles and amphibians. There is much work left to be done to ensure their future.

The book now being completed will help direct future research on these animals, because it identifies gaps in our knowledge and where new information is needed. Such books are as much history books as they are science books, because what is reported in them defines the history of these species in Virginia. They provide the baseline against which future changes will be measured. Thus, a major and largely unappreciated contribution of taxpayer donations to the Nongame Fund is public education about some of the most important animals in the Commonwealth.

What are some of the gaps? What information do we need now? Species that we now consider common could be in trouble within a few years. Eastern box turtles and black rat snakes inhabit fragments of hardwood forests. We have too little information on their reproduction and population structure to know if these species are declining in their habitats. Anecdotal observations suggest they are. Common and rare species need to be monitored. We need more detailed data on various aspects of the life histories of all herps in Virginia so that we can devise better management strategies.

Now, some of you are still saying, "I don't really like snakes or salamanders. Why should I donate money so that someone can study them?" I know I'll never convince some of you that amphibians and reptiles are beautiful animals that deserve to be respected simply for what they are. I know I'll never convince some of you that it's important to study them so that we can ensure these important links in our ecosystems will be around for another century or more. I talk a lot about how these animals are as much a part of our cultural and natural heritage as the things we see in Colonial Williamsburg. Some of you still aren't convinced. Perhaps the only thing I can add is that when we lose any part of our natural heritage, we lose more than a solitary animal. We lose a part of life itself. □

"A Muddy View of Life..."

A personal essay by Joseph C. Mitchell

A field herpetologist is a person who in some ways never grows up. He likes to get dirty and play in the mud. I am especially interested in the ecology of freshwater turtles, and catching turtles requires me to get muddy.

One project I have been involved in since 1987 that illustrates this is an annual event in Newport News. The Fisheries Division of VDGIF has used a small pond adjacent Newport News reservoir to rear northern pike. One day each fall, they drain the pond, catch the fish, and count and measure the pike stocked in the reservoir. This affords me an oppor-

Dr. Joe Mitchell; photo by Lynda Richardson.

tunity to catch all the turtles there. Once the water is down, I wade in the mud and muddle for the turtles that have not been caught in the net at the end of the discharge pipe. I use a hollow, metal pole to probe for the turtles that cannot be seen. Once a turtle is located, I reach down deep in the mud and extract it. Normally my helpers and I catch between 60 and 89 turtles each year. I take various measurements and code each turtle with an individual number by notching the margin of its shell. Then, each turtle is released into the reservoir.

A substantial number of turtles marked have returned to the pond the next or in subsequent years. The only way they can do so is to travel overland across a paved road. A couple of turtles have returned every single year, despite having overwintered in the reservoir.

This kind of work is fascinating because it generates information about these animals that is unknown to anyone but me. The best part of being a scientist is discovering something about nature that no one else in the world knows.

Naturally, however, it is incumbent on scientists to report this kind of information. So, for all the time I spend in the field collecting information and data, I spend at least twice as much at the computer and in my office analyzing the numbers and writing papers or reports.

I have worked with snakes longer than I have worked with turtles. One potential hazard is, of course, a snakebite. Although I have been bitten hundreds of times by nonvenomous snakes, I have yet to be bitten by a venomous one. I have simply been lucky. I once grabbed a large female northern water snake underwater and was bitten three times before I could get her out of the water for a proper hold. My hand was bloody, to say the least, but once that stopped, I had no other problems. Some people say you can get infections from snakebites, but I have never experienced it.

I guess I am more of a reptile person than an amphibian person. But that is not to say that I don't care to work with amphibians. I do. I have conducted research projects on the ecology of frogs and salamanders, and I recently have been working on assessing amphibian community structure in several locations throughout the state.

Working with salamanders and frogs often requires going out at night to search for them on the forest floor or in wetlands. Rain gear, waders, and headlamps are required gear. Warm coats are sometimes needed. I have broken the surface ice on ponds to look for winter-breeding salamanders. I have been nearly deafened standing in a chorus of Cope's gray treefrogs on a hot summer night. And fellow herpetologist Chris Pague and I experienced much joy in finding a large breeding congregation of barking treefrogs one night in an area in which they were not expected.

One of the most satisfying and at the same time frustrating kind of work I do is with endangered species. I know that my research and lobbying efforts have resulted in limited protection of some of these animals. But, I also know that without a change in people's attitudes about the loss of habitat so that real protection is afforded these species (i.e., habitat preservation), then eventually all will be for naught. Human population pressures will intensify our use of the landscape and squeeze the animals out. I only wish for my descendants the joys of experiencing our natural heritage as I have.

A field herpetologist will see many such changes in his lifetime, but he will never stop enjoying getting muddy. For, it is in getting muddy that he learns about these animals. □

Dr. Joe Mitchell teaches conservation biology at the University of Richmond and was the principal researcher on VDGIF's reptile and amphibian survey.

Nine-week-old bald eagle chicks; photo by Craig Koppie.

Focus on: Wildlife

by Rick Reynolds

Virginia is where the South meets the North, where southern habitats cease and northern habitats begin. Throughout the state we find unique animals and communities that identify Virginia as the melting pot for much of the diversity found in the Eastern United States.

This translates into sheer numbers of species, representative of both the South and North. The southeastern shrew, for example, finds its northern limits in eastern Virginia and Maryland. The water shrew, on the other hand, finds its southern limits in the mountains of Virginia and North Carolina. It is here, at the edge of a species range, that we see some of the greatest genetic activity. It is at the edge of their habitat where species push their limits and adaptations are developed.

Because Virginia represents the edge of the range for a number of species, we play an important role in the conservation of species represented throughout the East. With the passing of the State Threatened and Endangered Species Act in 1972, the Virginia Department of Game and Inland Fisheries has taken a lead role in developing conservation plans for Virginia's rarest species and communities. When a species is listed by the state, a recovery plan follows that identifies the goals, objectives, and a step-down approach for the recovery of that species. It is these recovery plans that direct our research and management.

To provide you with an understanding of the work that VDGIF's Nongame Program performs, we present to you an overview of some of the projects we're conducting throughout the state. It is through your tax-deductible contributions and the support that hunters, fishermen, and conservationists have provided that Virginia has one of the premier nongame programs in the United States.

Bald Eagle

The bald eagle is one of the most majestic birds protected by the Federal Endangered Species Act. It is also the bird most people are familiar with when you speak of the success of the act.

The decline of this species was attributed to both the loss of habitat and low reproduction caused by pesticides and heavy metals. By 1982, there were estimated to be only 1,500 pairs of bald eagles in the lower 48 states. With the ban on DDT and other pesticides in the early 1970s, reintroduction efforts were initiated. Today, the bald eagle has been downlisted to "threatened" in five states and its numbers are on the rise in many other states.

In Virginia, we have a very special role in the recovery efforts for the bald eagle. The James River houses the largest known summer concentration of bald eagles in the Eastern United States, as well as the largest winter concentration in Virginia. The U.S. Fish and Wildlife Service has acknowledged Virginia's role in the protection of the bald eagle by establishing a wildlife refuge on the James River. VDGIF biologist Dana Bradshaw is assisting Fish and Wildlife personnel with the development of management plans for the new refuge.

Our current efforts are directed toward monitoring the summer and winter populations. This year, we were presented with somewhat of a paradox with the breeding population. A record high number of nesting pairs were located, but a record low number of young resulted. The reason for the low productivity is not clear, but continued monitoring and analysis of eggshells may shed light on this issue.

Future work with the bald eagle will be directed at protecting and managing both their summer and winter habitats. Communication and education of landowners will play a major component in the recovery efforts for this bird. As Virginia played a key role in the settlement of the U.S., it is only fitting that we play a key role in the recovery of our national emblem.

Rare Bird Monitoring & Stewardship Program

A program that reflects the direction of the VDGIF nongame program is the Rare Bird Monitoring & Stewardship Program. This program monitors the health and status of birds whose numbers are still high, but populations are showing a declining trend.

Using volunteers solicited through the Virginia Society of Ornithology, these rare birds are tracked through the breeding season. Information on nesting success, predation, habitat use, and potential disturbance is collected. These data help us in monitoring and protecting these species. The ultimate goal of this program is to keep species from becoming threatened and endangered.

One of the rare birds volunteers are monitoring through this program is the loggerhead shrike. This is a bird about the size of a robin, but with hawk-like features including a sharp hooked bill. The shrike feeds on insects, small birds, mammals, and amphibians. Not having "talons" like the raptors, the shrike strikes its prey with its beak or impales prey on barbed wire or thorny plants. So, if you see an insect or small bird impaled on a barbed wire, keep your eyes open for the shrike that owns that tasty tidbit.

The endangered loggerhead shrike (photo by Rob Simpson) is one of many birds monitored by VDGIF's volunteer rare bird monitoring and stewardship program.

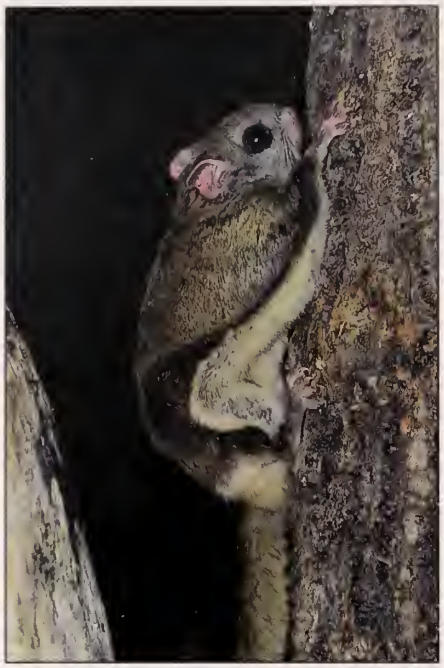
The loggerhead shrike has been declining throughout its range for a number of years now. The reasons for this decline are not clear, but most fingers point to the loss of habitat and pesticide use. VDGIF's initial work with the shrike was completed through a contract with Dr. Fraser at VPI & SU. Despite extensive work by Dr. Fraser and his graduate students, however, they could not find a single cause and effect relationship for the declines noticed in Virginia.

A point of interest Dr. Fraser and his students discovered was the number of shrikes that are killed by automobiles. This is understandable when you consider this bird preys heavily on large insects and that roadsides are good habitat for these insects. Although this cannot be cited as the major reason for this bird's decline, it is certainly a contributing factor.

The volunteers who work with loggerhead shrikes and other rare birds are an invaluable resource for monitoring certain species. A special thanks must go out to those who have helped to make this program a success. If you are interested in participating in the Rare Bird Monitoring and Stewardship Program, please call the VDGIF nongame office at 804/367-6913.

Northern Flying Squirrel

High in the spruce-fir forests of Virginia, the northern flying squirrel leads a secretive life. Unlike most squirrels, the northern flying squirrel is active at night and sleeps throughout the day.



Besides having its days and nights switched, its choice of food is not your typical squirrel diet. This squirrel prefers to dine on lichens and fungi instead of the acorns and nuts we are used to seeing squirrels eat.

Now, before you write to tell me about the northern flying squirrel on your uncle's farm, let me tell you about its cousin, the southern flying squirrel. This squirrel is more widely distributed than the northern flying squirrel and can be found in country settings throughout Virginia. It is a smaller squirrel, with a pure white belly, and has been found in some unusual places. Recently, a friend told me of a southern flying squirrel that stole the sermon during a church service as it flew from a rafter to the pulpit and then escaped across the pipe organ and out the choir loft.

Because the northern flying squirrel is tied to high elevation spruce-fir forests, its numbers and distribution are limited. The major reason for the decline in this species goes back to the late 1800s and early 1900s when most of the spruce and fir forests in Virginia were logged. Although this animal was never widely distributed in Virginia, it is still a key player in the ecological diversity and heritage of Virginia.

Our flying squirrel program in the past has concentrated on learning the life history of this elusive animal. Under the direction of Dr. Pagels of Virginia Commonwealth University, we've learned about the foods this squirrel eats, how many young it has and at what time of year, and how it interacts with its cousin the southern flying squirrel. Our future work includes the promotion of spruce-fir forests in the parts of Virginia where it was once prevalent. By increasing the habitat, we hope to increase the population size and stability of the northern flying squirrel in Virginia.

Bats

With over 3,000 caves in the mountains of our state, it's no wonder Virginia is home to a multitude of bats. "Bats? Ugh!" you say. "They get in your hair and they give me the creeps!" Well, before you cast these mammals off as a flying nuisance, hear me out.

First, a bat can detect a mosquito in the dark and pick it out of the air in mid-flight. With this skill and ability, it is easy to see that a bat is not going to blunder into your head. Second, bats consume a large number of insects. Most can consume more than half their weight in insects each night. Third, bats are extremely valuable in medical and other research. They have contributed to the development of navigational aids for the blind, vaccine testing, drug testing, studies on aging, and speech pathology.

In Virginia, we have three federally endangered bats, the Indiana, the gray, and the Virginia big-eared. Now, to most of us, a cave is a cave is a cave. Not so to the bats whose specific cave requirements go unnoticed by the untrained eye.

Indiana Bat

Indiana bats only use caves for hibernating or roosting while waiting out Old Man Winter. Doesn't sound like a bad idea does it? They prefer caves with relatively high humidity (66-95%) and temperatures between 38 to 43 degrees. In addition, they don't mind sharing their caves with other bats, and are usually found with little brown, big brown, or small-footed bats. However, once spring rolls around, the Indiana bats leave the caves and venture out.

Until recently, little was known about the summer habits and ecology of these bats. Work in Indiana demonstrated that males stayed close to the hibernacula (or winter cave site), roosting in rocky crevices

Opposite, far left: *By promoting the increase of the spruce-fir forest habitat which the endangered northern flying squirrel needs to survive, we hope to help this elusive animal recover its population in the state.* ***Opposite, left:*** *There are only 15,000 Virginia big-eared bats known in the world, and Virginia is the home for one-sixth of this population. VDGIF is working to identify and protect their caves throughout the state.* ***This page, above:*** *Possibly Virginia's most endangered species, the red-cockaded woodpecker in Virginia consists of 12 adults and six young. The future does not look bright for this species in Virginia, which has lost the open, mature pine forests it needs to survive. All photos by Rob Simpson.*

or under the loose bark of trees. The females proved to be a little more adventuresome, and traveled as far as 200 miles to find a place to rear their young. The females establish maternity colonies of 50 to 90 individuals and usually raise their young under the loose bark of a tree in a riverine setting.

Here in Virginia, our early work concentrated on finding and protecting the major hibernating sites for this species. This past summer was our first attempt at locating maternity sites. Working with Dr. Leffler of Ferrum College, and Chris Hobson, a graduate student at Tennessee Tech, we netted along streams and rivers in western Virginia. While this effort didn't produce any maternity sites, we did catch Indiana bats and have narrowed down the locality of one of the maternity sites.

This effort will continue next year and we're confident that we'll be able to find a maternity site or two. By identifying the critical winter and summer sites, we'll be better equipped to protect this species.

Gray Bat

The gray bat visits Virginia only in the summer and migrates south to spend the winter. Unlike other bats, they set up a large home range consisting of many caves. Instead of choosing one cave, the gray bats float between a series of caves during the summer. Pregnant females are the exception to this rule. They are very specific when it comes to selecting a cave to raise their young in.

An interesting cave feature that pregnant females seem to key in on is the presence of a stream running through the cave. Biologists have yet to determine whether this is coincidence, or if there is a biological reason for it. Either way, because of this specific habitat requirement, fewer than five percent of all caves are suitable for gray bat maternity sites.

In Virginia, we have one known maternity site, in the southwestern part of the state. In addition, Virginia has between 10 and 20,000 individuals that use the caves in southwest Virginia. Each year, we monitor both the maternity and bachelor sites to assure protection and detect changes in the population.

This past year, while netting for Indiana bats, Chris Hobson made a new discovery. Chris found a lactating (nursing) female gray bat in an area we didn't believe pregnant females were using. This is a great find, as this means we may have another maternity site in Virginia. Next summer will complete the story when we net this site again. Using radio telemetry, we will place a transmitter on a female bat and follow it back to the maternity site.

Virginia Big-Eared Bat

The Virginia big eared-bat is by far the most endangered bat in Virginia. There are only 15,000 individuals known of this species and Virginia houses one sixth of this population. The majority of Virginia big-eared

bats reside in our neighboring state, West Virginia.

In Virginia, we know of two caves these bats use. One of these sites is used as a maternity cave and the other was believed to be used only as a hibernating site. However, a visit to this site two summers ago astounded biologists when they noticed big-eared bats leaving it. We have yet to determine if this is a maternity site or a bachelor site, but it is certain that the big-eared bats use this cave year-round. Between The Nature Conservancy and VDGIF, we have had the good fortune to establish conservation easements with the landowners of these two caves. The conservation easement is a "gentleman's agreement" in which the landowner agrees to work with biologists to protect the site and the bats. Both landowners are proud to have such a unique animal on their land and support the conservation of one of Virginia's rare bat species.

Our work with this mammal is not over, however. With over 2,000 bats using the wintering cave, we can only account for about 800 bats during the summer. This means we may have another maternity site in the area as well as a possible bachelor site. Our efforts will continue to locate the other populations and complete the picture for this species.

There is some cause for concern over the status of the Eastern woodrat. Although its population seems stable here in Virginia, woodrats are experiencing declines in New York, Pennsylvania and Maryland. Thus, VDGIF is supporting studies to gain more information about our woodrats in the hopes of identifying any changes that in the future may cause its decline; photo by Rob Simpson.

Red-cockaded Woodpecker

Perhaps Virginia's most endangered species, the red-cockaded woodpecker is a bird of a different feather—in more ways than one. While most birds mate and raise their young as a couple, the red-cockaded chooses the cooperative family style for raising their young. Soliciting the help of younger birds and unmated males, family groups can range from 6 to 8 individuals and be as large as 15 individuals. Everyone in the family helps with protecting their territory as well as feeding the young. It has been shown that these family groups are more productive than a single mated pair, demonstrating the advantage of the family life-style.

In Virginia, we're down to our last five sites where red-cockaded woodpeckers are found, with 12 adults spread among these sites. This year, they raised a total of six young at three of the sites. Not a very good return for a family effort that should produce two to five young per site.

So, what's going on here? The red-cockaded appears to be stressed by the lack of suitable habitat in the state, specifically open mature pine forests. With competition from the lumber industry and the development of southeastern Virginia, little room has been left for this bird.

In addition to competition with man, the red-cockaded woodpecker faces other obstacles. A natural competitor for cavity space is the red-cockaded's cousin, the pileated woodpecker. A pileated will move in, push its smaller cousin out and take over cavity construction, forcing the red-cockaded to move elsewhere. To help the red-cockaded woodpecker, biologists use cavity restrictors to discourage the pileated and displace them to other areas. The restrictors, pieces of metal placed around the cavity, limit the size of the cavity opening, forcing the pileateds to look elsewhere.

While these management efforts help, they are not a cure for the fact that these birds are simply running out of places to live. The open, mature pine forest is a rare habitat in Virginia as well as throughout the Southeastern states.

VDGIF biologist Dana Bradshaw has been working with landowners to protect mature pine forests and develop management plans to protect this species. Through these efforts the red-cockaded woodpecker might find a place in the future of Virginia. But, for now, it's a future that's hanging by a thread.

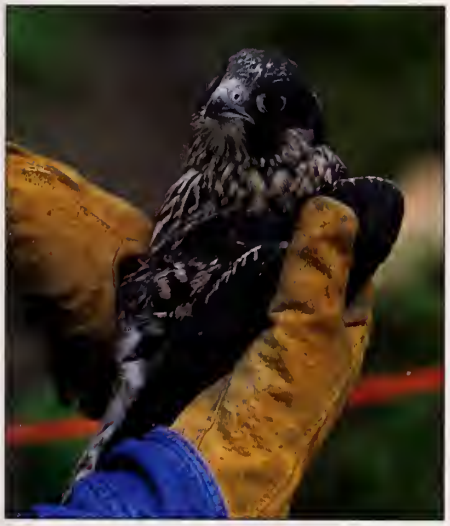
Eastern Woodrat

The eastern woodrat, commonly known as the pack rat, was once among the most common mammals west of the Blue

Ridge. This animal was a frequent night visitor at campsites and picnic areas along the Blue Ridge Parkway and in the National Forests. Today, for reasons that are unclear, their distribution and numbers are declining. You no longer can expect their company for a late-night snack at your campsite.

Woodrats are unique animals; their presence is usually indicated by elaborate houses constructed of large sticks and decorated with colorful items such as bottle caps, coins, feathers, and shotgun shells. Each house may contain two or more spherical nests made of grasses, shredded bark, paper, wood chips, and feathers. Within the house can be found storage areas for food, while well-traveled paths leading from the house identify latrines.

Though the woodrat is neither threatened nor endangered, Virginia



Peregrine falcons in Virginia are one of our success stories. Completely wiped out in the Eastern U.S. due to pesticides, VDGIF has participated in reintroduction efforts since 1978. In 1992, 232 peregrines had been released in Virginia. Last year, five pairs produced nine young; photo by Tim Wright.

biologists are monitoring this species because of the declines noticed in New York and Pennsylvania, and most recently in Maryland. In New York, the once common woodrat has disappeared from all but one area. The same pattern is showing up in eastern Pennsylvania; historic sites where the woodrat could be found are now barren of their presence.

Dr. Mengak, biology professor at Ferrum College, has been monitoring Virginia's woodrat populations for four years now. With assistance from college students and VDGIF biologists, Dr. Mengak has been trapping sites throughout the mountains of Virginia. By learning the biology of this species while it is healthy, we hope to identify any changes that may cause its decline.

Peregrine Falcon

If I had to pick a favorite threatened or endangered species, the peregrine falcon would certainly rank near the top. Wearing "heavy sideburns" and a coat of steel blue or gray contrasted against a lightly mottled belly, this bird looks truly royal. And, if you have had the luck of seeing this bird in action, you would understand why it is the envy and pride of every falconer.

Historically, the peregrine ranged throughout the East, using rocky outcroppings in the mountains from which to nest and forage. Considered to be "the fastest bird in the world," the peregrine has been clocked at over 200 mph. Obviously, it couldn't hold this pace at the Daytona 500, but if you were part of its diet, you certainly wouldn't want to get into a footrace with this bird. Feeding almost exclusively on other birds, the peregrine takes its prey while on the wing, rarely taking a bird from the ground.

This bird, along with other large predators, paid the price of pesticide use in the mid-1900s. By the early 1960s, the peregrine no longer ranged throughout the Eastern United States. Recovery and reintroduction efforts started with the banning of DDT in the early 1970s.

Virginia's Nongame and Endangered Species Program began reintroduction efforts in 1978 by raising and releasing young in "hack towers" located on the Eastern Shore. By 1992, 232 peregrines had been released in Virginia.

A unique effort was conducted this past year when peregrines were hacked from a bank building in Roanoke. While these peregrines cannot control Roanoke's pigeon population, they have put the "fear of the Lord" into those pigeons brave enough to venture out.

In addition to the reintroduction efforts, biologists and volunteers comb Virginia each year in search of nesting pairs. This past year we found eight nesting pairs in coastal Virginia. Of those, five pairs produced nine young. While we still haven't found a nesting pair in the mountains of Virginia, we're optimistic that our luck will change.

Lee County Cave Isopod

The Lee County cave isopod will be our newest threatened and endangered species upon completion of the listing package being developed by the U.S. Fish and Wildlife Service (USFWS).

"The Lee County iso - who - what - pod? What in the Sam hill is and who in the world could ..."

O.k., o.k., just hold your horses and save your judgement until I tell you something about this critter.

Isopods are a group of small, insect-like animals that live in a variety of habitats. Most people are familiar with the pill bugs and sow bugs that you find under rocks or logs in your backyard. They are small, hard-shelled bugs that roll up in a ball when touched. The Lee County isopod is related to these bugs; it is a small (1/4 inch), white animal found in pools or streams inside caves.

These cave isopods can be so specific about where they choose to live that they may occur in only one or two places. Such is the case with the Lee County isopod. This critter was known from only two caves in Lee County. But, with the pollution of one of those caves, it is now only found at one site.

So, why worry? Be happy! It's only a bug and not me! Well, perhaps we can live without the isopod. But

on the other hand, like the peregrine and the bald eagle, the isopod is our "canary in a coal mine." You see, still waters run deep, and when you look at water underground, you will see that it all runs together. When a site is polluted, the pollution doesn't stop at a property line, but rather moves wherever gravity takes it. By following the status of these "little canaries," we can keep a watchful eye on the health of our waters.

The owner of the last known site of the Lee County cave isopod is of that same opinion. He wants to make certain the isopod stays fat and healthy in his cave. For, as long as the isopod is healthy, he knows that his water is healthy. With this in mind, the USFWS and VDGIF have entered into a conservation agreement with the landowner to protect this site.

Barn Owl

The barn owl is the nighttime equivalent of a hawk. They both prey on small mammals; it's just that hawks work during the day and owls at night.

Barn owls adapted well to the booming agriculture development in the early and mid-1900s. The open, grassy lands supported plenty of small mammals and the numerous barns and silos offered ample nesting sites. Working at night, the owl uses its many special adaptations to catch mice in the dark. For example, the feathers on the barn owl's face help the owl find food. These feathers create a concave surface that acts as a reflector, channeling sounds to the ears, and giving the owl the ability to detect the slightest movement of a small mammal. The direction of a mouse is determined by the time it takes the sound to reach each ear.

Changes in land use practices from agriculture to industry and housing development, along with intensified farming, have been hard on the barn owl, eliminating its habitat at an alarming rate.

A survey conducted in 1986 by VDGIF and Dr. Mitchell Byrd showed that of 111 known nest sites, only 43 were still active. Not only was the barn owl decline noticed in Virginia, but this trend was documented throughout its range. Additional research, sponsored by VDGIF, demonstrated the lack of suitable nesting sites as a limiting factor to barn owl productivity. In 1986, VDGIF started a nest box program to provide nesting structures for barn owls in rural farm settings. By 1989, 35 of these nesting structures were being used.

Barn owls; photo by Craig Koppie.

In addition to the nest box program, VDGIF is working with farmers to adopt management practices that benefit barn owls and other grassland species. Only through the efforts of private landowners will we be able to maintain this unique bird as one of Virginia's natural resources.

If you would like to participate in the barn owl nest box program, please call VDGIF's Nongame Program office in Richmond at 804/367-1000.

Delmarva Fox Squirrel

The Delmarva fox squirrel is Virginia's most endangered squirrel. With only one population left in Virginia, located in the Chincoteague National Wildlife Refuge, the future of this squirrel is questionable.

The Delmarva fox squirrel once roamed the coastal forests of the Eastern Shore up through Maryland and into southeastern Pennsylvania and southern New Jersey. With the cutting of the coastal forests and conversion of forestland to agriculture, this squirrel was gone from Virginia by the early 1900s. Fortunately, several populations continued to flourish in other parts of the squirrel's range.

Delmarva fox squirrel; photo by Lynda Richardson.

The Delmarva fox squirrel was listed as an endangered species by the USFWS in 1967. In 1968, the first attempt to reintroduce the Delmarva fox squirrel in Virginia was conducted. In 1982, an attempt was made to restock the Delmarva fox squirrel at a second location. While the first restocking at Chincoteague National Wildlife Refuge was a success, it appears that the second attempt in Northampton County has failed.

Perhaps the greatest drawback in reintroducing the Delmarva fox squirrel is its need for large areas of old "park-like" forests. This squirrel sets up "home ranges" in which it feeds, mates, and lives out its life within these forests. A single home range can be anywhere from 30 to 75 acres, a large area for a relatively small animal.

Our current work is centered around maintaining a productive population in the Chincoteague National Wildlife Refuge. In addition, we are looking for other potential sites to relocate this squirrel. Again, you see where we are faced with the issue of limited habitat. And with this issue, each of us must decide whether or not we can find room for this animal in our state. ☐

For the Love of Bats

A personal essay by Rick Reynolds

I could hardly keep my eyes open, I had been up all day and night, and now, at four in the morning, fatigue was getting the better part of me. "Bleep, bleep, bleep" came over the receiver and an innate response pulled me out of my chair as I tried to locate the direction of the bleep. This was how it was and how it was going to be for the next two weeks as we followed the movements of the big-eared bats, a federal endangered species.

Up until now, little was known of the foraging activities of big-eared bats. This study was a continuation of work that Dr. Ginny Dalton had started a couple of years ago to determine the habitat and areas big-eared bats used for foraging. With the bats using only a couple of known caves in Virginia, it was critical that we learn as much as possible about this species in order to protect the animals. We had already acquired landowner agreements to protect the caves, but what about the areas the bats used outside the caves? Our concern was that the bats could start to show signs of decline due to loss or degradation of habitat outside the cave. So there I stood, half asleep in the pitch dark, trying to figure which direction my bleep was coming from.

It all started with the netting of a half dozen bats off the ceiling of the cave. We attached radio transmitters the size of a pencil erasers to their backs with surgical glue that would hold the transmitters on for approximately two to three weeks. Because of this short time frame, we had to work 12-hour nights and 4-hour days. We were thinking, talking, breathing, and chasing bats.

As the nights blurred into one another, patterns started to develop. Bat 501 was using the east end of the valley, bat 682 was spending most of her time up on the ridge on Forest Service property. But the question remained, were they dining in corn fields or alfalfa fields or forest or shrub or pasture land? Now the time came to separate the weak-hearted from the thick-headed. Now we had to follow the bats on foot. Wherever they would lead, we were bound to follow.

VDGIF nongame wildlife biologist Rick Reynolds; photo by Lynda Richardson.

So there we stood, each assigned a bat. Number 610 was to be my nemesis, the one that liked the thick forest. Just the place I wanted to be: out in the middle of a dark forest by myself. As I sat at my station, a rocky outcrop along a cattle trail, waiting for the chase, Number 610 flew by, giving a signal so strong that it knocked me off the rock. I quickly jumped up and locked onto her with the receiver and set out on foot. Immediately, she went off the trail and into the woods, pulling me straight up the hill. Didn't she understand that I had just spent the last three months in an office sitting on my haunches eating double-stuffed Oreos?

And so the chase continued for the next hour and a half, when, as suddenly as she had appeared, she stopped. A minute passed, then two, then five, and I thought to myself that perhaps, out of the kindness of her heart, she decided to give me a break. As I caught my breath, I looked around and realized that in every direction was a wall of blackberries eight feet high. I realized then that I was being paid back for putting that snake down Jenny Crawford's shirt back in fifth grade. But, number 610 gave me little time to ponder my situation as she bolted away. Forgetting the berries, I followed in earnest.

This was how it was going to be for the rest of the night. From 11 that evening until four-thirty in the morning, I received a aerobic workout that rivaled the likes of anything Jane Fonda could dream of. I made it back to my rendezvous spot later that morning and laid my head on a rock as I waited for my ride. I knew then I was one of the thick-headed ones.

Sometimes it takes this kind of effort in order to gather the information necessary to protect an endangered or sensitive species. This project proved that the big-eared bat is rather flexible in deciding where it will dine, which is great news for us, since it makes conservation for this species a little easier.

As for me, I'm still picking out thorns and looking forward to those double-stuffed Oreo days.

Rick Reynolds is a VDGIF nongame biologist working in the western part of the state.

The Bald Eagle: Diary of a Flagsl

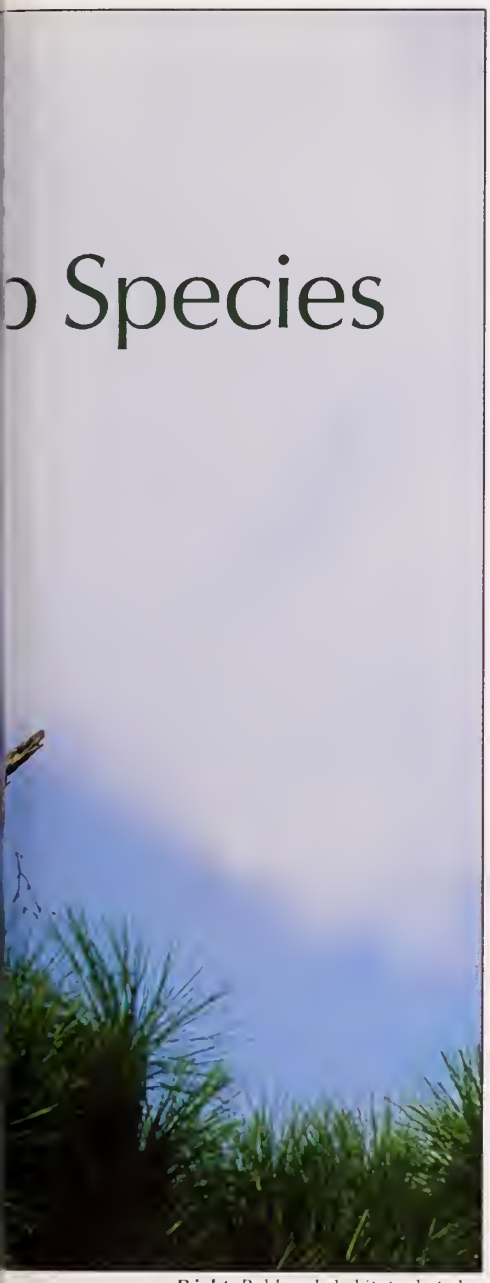
The bald eagle is recovering in Virginia, but its future is still unclear. ***Above:*** *photo by Lynda Richardson.*

by
Dana Bradshaw

Probably no other single wildlife species has been more maligned, yet more revered, than the bald eagle. Our national symbol has shaped much of endangered species management philosophy in the East. It has helped steer the interpretation of endangered species law at the state and federal levels. And it has become one tool in the arsenal of weapons that anti-endangered species lobbyists will assail Congress with this coming year in the battle to reauthorize the Endangered Species Act.

There are very few neutral opinions about bald eagles. They are either thought of as majestic birds of prey, or they are perceived as the bane of our existence, spoiling progress, creating a nuisance and a hindrance to economic gain. Whatever one's personal opinions, few can truly appreciate the role that bald eagles have played, and continue to play, in wildlife conservation.

We all know the story of their dramatic comeback from the DDT years. An all-time low of 33 nesting pairs in Virginia in 1977 produced a mere 18 young birds. No eagles nested on the James River during that year. Now, 16 years later, there are 26 active nests on the James and a total of 131 nesting pairs statewide. These nests produced 142 young eagles in 1992. Although we will never reach the estimated 600 to 800 pairs



Right: Bald eagle habitat; photo by Craig Koppie.

thought to have existed along the entire Chesapeake Bay a half century ago, this was a dramatic recovery by anyone's standards, and a textbook case of what the Endangered Species Act was supposed to accomplish.

Federal laws have managed to prohibit a substantial amount of habitat loss that would have directly destroyed eagle nesting sites. And, fortunately, it has become darn near impossible to indiscriminately shoot or trap bald eagles with impunity. Even another modern-day chemical pesticide has recently been banned from use (Carbofuran), largely due to its impacts on migratory birds, in particular, the bald eagle.

Provided with these facts, one can appreciate how bald eagles may have achieved a rapid recovery. Unfortunately, it is a rapid and successful recovery that too many people believe has already been achieved. In fact, the bald eagle is under review now for reclassification to a less endangered status. If approved, the eagle may soon be recognized as a "threatened" species under the Endangered Species Act, rather than an "endangered" one.

At face value, this is a biologically sound decision. The bald eagle has reached the initial recovery goals established by the Chesapeake Bay Bald Eagle Recovery Team. And even as a "threatened" species, bald eagles will still enjoy basically the same legal protection they currently have under the law.

The problem with this event transpiring is that we, as wildlife biologists, now realize how little we have actually accomplished toward the conservation of bald eagles, and subsequently toward threatened and endangered wildlife as a whole.

Granted, biologists play a large role in reviewing federal and state permits with respect to potential wildlife harm. In this manner, many activities have been curbed that would have threatened bald eagles as well as other wildlife. And, at least two national wildlife refuges and one state park have been dedicated to the protection of bald eagle habitat in Virginia alone.

Yet, an argument could be made that eagles have recovered in the Chesapeake Bay largely in spite of us, rather than because of us. And now that we are faced with the prospect of a diminished regulatory status for bald eagles, we must take stock of what mechanisms are in place to ensure their sustained recovery.

The Endangered Species Act, the Migratory Bird Treaty Act, and the Bald Eagle Protection Act are all federal laws that have been effective in protecting existing eagle nest sites. Yet these laws are useless in an effort to secure protection for future eagle habitat that will meet the needs of an increasing bald eagle population. Even the Chesapeake Bay Preservation Act is primarily a water quality guardian, with no specific provisions for wildlife.

Bald eagles are primarily associated with the Bay and its major tributaries. Most pairs nest within a mile or so of principal rivers or creeks. Unfortunately, few of us could have foreseen the dramatic changes that the Chesapeake Bay region has undergone in recent years, including the emergence of an urban crescent from Washington to Virginia Beach; the subdivision of large farms and estates; and $200,000 waterfront lots. In short, we are witnessing a burgeoning human population which is demanding space and facing very few hurdles in getting it.

The implication of this for bald eagles is that space is becoming an increasingly rare commodity, one that is less frequently reserved for the needs of wild things. Our regulatory measures have protected nest sites and the birds themselves, but it has always been assumed that if we could just get their population back up, there would be plenty of places for them to live. We are now finding that is not the case.

Of the 131 active eagle nests last year, more than 100 of them were on private land. Although most of these landowners are sympathetic to the existing eagles' needs, the needs of

an increasing eagle population are not being addressed adequately. The reason for this is that almost all of the remaining land in the eastern half of

the state is also privately owned, and owned by people who do not have a clear understanding of the requirements of wildlife species, whether endangered or common. Most of us fall into this category.

One answer, then, is to adopt a new conservation tool. Perhaps even more importantly, we need to adopt a new conservation philosophy. Not, "how many nest sites can we protect?" But, "What do bald eagles need on a regional level? What else can we protect along with bald eagles? What wildlife species share the same habitats? What plants?"

The Game Department has embarked on one recent effort to put some of these new strategies into action. In a collaborative effort with the College of William and Mary, everything we know about bald eagle habits and habitat in Virginia is being analyzed to generate an entirely new management tool. We are working with over 20 years of data on nest sites, foraging habitat, and landscape characteristics to derive a model of what bald eagle habitat looks like, and what bald eagles like in their habitat. This information can then be used to guide the decisions of county planners, developers, landowners, and anyone that has an interest in eagle conservation.

Thanks to dedicated sponsors like Virginia Environmental Endowment, more efforts like this are now the trend. Likewise, the Division of Natural Heritage at the Department of Conservation and Recreation is identifying natural areas and delineating critical habitat areas where many rare plant and animal communities come together and can be more efficiently protected. Bald eagles are a benchmark species in many of these efforts. Wildlife management now is focusing on a more comprehensive conservation goal, one that addresses future needs on a regional basis, not the localized efforts of the past. And, although eagles can't take credit for bringing about these new tools and attitudes, probably no single species has done more to highlight this need than bald eagles.

Our Founding Fathers did the bald eagle a great service when they designated it as our national symbol. They attached a label of honor and respect to an ordinary animal that enabled it to achieve extraordinary distinction as an endangered species. Without a doubt, it is easier to protect a national symbol than a big-eared bat or canebrake rattlesnake. Yet, if the eagle is downlisted to threatened status, it will probably lose its flagship position on many states' rosters. It may no longer be the leading species that has helped shape the enforcement of the Endangered Species Act and served as a standard by which protective measures to other less appreciated, but just as important, species are doled out.

The bald eagle has been an ideal teaching tool for a society of slow learners. We were able to race around for years and take credit for a lot of great wildlife conservation until we were hit with the realization that we hadn't really done much to ensure its recovery. Now that we are forced to better understand the problems that eagles face, we are in a better position to address the needs of all wildlife.

Unfortunately, we may have moved too late to save the bald eagle. We may never be able to secure protection for enough bald eagle habitat to sustain a recovery. And, no doubt, at some point in the future we may once again have to evaluate just how important our national symbol really is. ☐

Dana Bradshaw is a nongame and endangered species biologist with VDGIF.

Wildlife management now is focusing on a more comprehensive conservation goal, one that looks beyond the needs of a single species in a single area at a specific point in time, to the future needs of associated species on a regional basis. Perhaps no species has done more to spur this thinking in a new direction than the bald eagle. ***Right:*** *4 and 1/2-week-old eaglets; photo by Craig Koppie.*

Show How Much You Care...

Osprey; photo by Craig Koppie.

...Give To Virginia's Nongame and Endangered Species Fund

Many of Virginia's wildlife are in danger. Suffering from habitat loss and the dangers of pollution which threaten their survival, many species in the state are struggling to survive.

The Department of Game and Inland Fisheries is responsible for the protection and conservation of all wildlife in Virginia, but we receive no state tax dollars, and we need your help to do our job. Help us fund critical research and management programs for the state's nongame and endangered species by contributing to our Nongame Wildlife Fund, which is supported by voluntary contributions made through our state tax checkoff program and direct giving.

This year, please make a donation on your state income tax form or simply send in your tax-deductible check (made payable to the Treasurer of Virginia) to: Virginia Nongame Wildlife Fund-VW, Virginia Department of Game and Inland Fisheries, P.O. Box 11104, Richmond, VA 23230-1104.

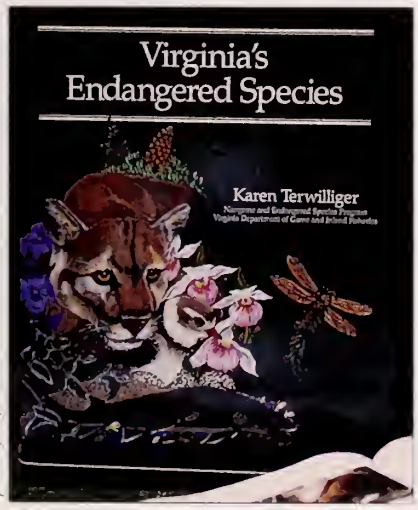


photo by Roy Edwards

Resource Guide Available On Virginia's Endangered Species

Order the only comprehensive resource guide on Virginia's Endangered Species for $32.94 (softcover) or $59.95 (hardcover). This 675-page guide identifies and describes more than 250 rare and endangered plants and animals in Virginia. Produced by the Virginia Department of Game and Inland Fisheries and other state natural resource agencies, this book documents the latest scientific information on Virginia's endangered species, information which is available in no other publication, *anywhere*.

Send your check plus 4.5 percent sales tax and $3.00 ship and handling charges to: McDonald and Woodward Publishing Company, P.O. Box 10308, Blacksburg, VA 24062-0308. Phone: (703) 951-9465.

To order a Virginia's Endangered Species poster featuring the cover illustration on the book (*left*), please send a check for $8 (made payable to: Treasurer of Virginia) to: VA Endangered Species Poster Offer, Attn: Diane Davis, VDGIF, P.O. Box 11104, Richmond, VA 23230-1104.

A Message In Art

Willy Wilmoth is an environmental sculptor who uses his art to open our eyes and our hearts to our connection with wildlife.

by Barry Saunders

Willy Wilmoth creates sculptures of animals in their natural habitats so lifelike and authentic that people often need to touch them before they believe they are carved from wood. But Willy is also an artist with a message and a mission—an environmental sculptor who uses his art to tell a story that he hopes will open our eyes—and our hearts.

"At times I feel like a translator," says Willy. "I will see something happening in Nature and I get the feeling that I have got to take and show this so that other people will see it and understand.

"I want people to be aware of what we are losing. Everything that is natural is in danger of vanishing into the past tense. I try to get the person viewing my sculptures to see how we rely on wildlife and in turn how they rely on us."

Willy has been carving for over 40 years and has felt connected to the in-

nerworkings of nature throughout his life. He grew up in Chesterfield County, and spent much of his childhood with his grandparents on their small farm. As young as age nine, he remembers his grandparents giving him the freedom to go into the woods and explore without supervision.

His grandmother taught him the skills he needed to survive, and his grandfather taught him patience and the skill of observation. "He taught me that when you're looking at a snake, you don't just look at it for five minutes; you look at it for hours, trying to find out as much as you can."

Out of the freedom to explore and the patience to observe, Willy "picked up a feel for wildlife." He pursued a desire to become acquainted with what he calls the "language of nature."

"You learn animal body language slowly," he points out. "You receive it in bits, a little here, a little there, and then finally you get a picture of the whole--the way animals communicate and relate to the environment and survive because of their relationship with their habitat. Animals do not lie. And their body language is very truthful. Humans are not."

During his early adult years, Willy found his understanding of nature's universal language confirmed. While serving in the United States Navy near Antarctica, he traveled to Australia for some rest and relaxation and spent some time with a tribe of nomadic aborigines. Although neither he nor they ever spoke a word, they easily communicated, because members of the tribe expressed themselves with the same movements and body language Willy had observed in wildlife. "They had never been to Chesterfield County, and I had never been to Australia, but there was no need for a spoken word. It was just gestures: a shrug of a shoulder, a movement of an eye. I could understand them because they *lived* nature. They understood things about people and life that philosophers have written volumes on."

*Willy Wilmoth (**above**; photo by Roy Edwards) works in his house in a remote part of Dinwiddie County, (**left**; photo by Roy Edwards) His "Fallen Friends" sculpture (**opposite top**; photo by Dean Hawthorne Photography) is displayed at galleries with the following inscription: "Many forest animals, like this screech owl, lose their forest homes to man...The 'almighty buck' often outweighs the life of forest creatures. Man's need for fast-paced change interrupts Nature's rhythm. It takes millions of years for life to evolve, and only a fraction of a second to destroy it." **Opposite bottom**: Red-tailed hawk feathers sculpted by Willy Wilmoth; photo by Roy Edwards.*

Willy's sculptures are marked by a mastery of design and aesthetics that most artists study for years to acquire, but he is completely self-taught. "I started carving, I don't know exactly when. It seems like from day one I always had a pocketknife. And that's when I started carving. I would just carve and things would come out. I had never seen any carvers; in fact, I'd never heard of any. The ability was just there."

Over the years, Willy's pieces have become more intricate and complex, but his approach to creating them has remained rooted in his keen observation and intimate understanding of his subjects. "I feel like my knowledge, my feelings, and understanding of nature were acquired as a kid, and over the years they have just laid there and laid there until my skills got to the point where I could really show them with accuracy. Then all of it started coming back into focus. Now, I interpret my knowledge into art. For people who aren't used to wildlife, who aren't used to feeling wildlife, they can understand it a little better through my art."

Willy works from memories of things he has seen. "I don't do carvings of things I have never seen; I will not. Unless I have actually seen it, I will not carve it." He studies his sub-

jects until he knows their individual personalities—"how a particular bird will respond, for instance, when its mate comes around, or how it moves its tail when it's trying to say something."

And, while Willy sometimes studies books, drawings, and details of animals to augment his observations, he never creates studies or drawings before beginning a sculpture. "I work on a piece in my head until I get it all worked out. I take it and suspend it in mid-air and rotate it around, looking at every aspect of it. I see how the light hits it. I paint it in my mind. And I get inside of it and look out to see what it's looking at and what's looking at it.

"When it comes time to actually carve, I already have pre-programmed what I'm going to do. I don't start until it's ready in my mind. Once I start carving a piece, I begin working out another one in my mind, because the program for the piece I'm carving has already been written."

Ask Willy about the philosophy that guides his art, and his response is simple: "To be a true artist, you have to give back more than you take." In recent years, Willy has given back by teaching others. He started teaching woodcarving at John Tyler Community College, and is on the Board of Directors for the Wakefield Center of the Arts. He participates in workshops for the Children's Museum of Richmond, the Hand Workshop, and has recently volunteered to work with the Education Division of the Virginia Department of Game and Inland Fisheries (VDGIF) in developing a program to use nature to create art. More importantly, however, Willy has begun to observe things he feels compelled to share with others, and his talent gives him a quiet but powerful pulpit from which to spread his message.

"Some people need a spark to understand different things in nature," he says. "I try to show people the good things and the bad things that are happening, to make people aware of what we are doing and where we are headed.

"My sculptures are meant to touch every sense possible, focusing on touch and sight. Every sculpture includes true-to-life details that make viewers feel that they have stepped into the realm of nature. Some of my pieces might only give you a "hint" of nature. For example, one of my pieces is a stump with a single feather. What I'm saying here is that if we continue to destroy our forests, then we will lose our wildlife. And that's why I call myself an interpreter—a spokesman for wildlife."

Many of the subjects of Willy's work are non-game species whose habitats are being destroyed by the cutting of timber, loss of wetlands, pollution, and other environmental dangers. His sculptures call attention to the interrelatedness of their habitats and their survival. The sculpture entitled "Fallen Friends" depicts a dead screech owl resting in the hollow of a tree, felled during the clearing of a tract of woods for timber. When the tree fell, the owl lost his home and his life.

In the sculpture "I Cry for You," Wilmoth depicts a red fox melting back into the earth after losing its life to starvation caused by pollutants in its habitat. Its rib cage is showing and it has no body fluids. Viewers can see the bones in its leg. A teardrop of compassion for the plight of mankind falls from its eye.

Other pieces celebrate the beauty and mystery of nature. "Brush Pile" depicts a Carolina wren resting in a

simple pile of twigs. "Guardian" portrays the intensity and determination of a copperhead ready to protect itself from an intruder. And "Hummingbirds" captures the beauty of ruby-throated hummingbirds feeding on a trumpet honeysuckle.

The sculpture entitled "Loggerhead Shrike," captures a species on the decline. Willy wanted to carve a sculpture of the shrike because its population has been diminishing. He

Opposite page: *"'Death of a Forest' depicts the dangers forest wildlife face as man continues to invade the land and destory natural habitats. The feather of a great-horned owl is set upon a tree stump. It shows that the clear-cutting of forests...leaves tracts of once-rich habitats barren. Creatures are forced to leave their homes or die."—W.Wilmoth.*

Top: *A pile of simple twigs can make a suitable habitat for a songbird—in this case, a Carolina wren. The twigs of the sculpture entitled "Brushpile" were carved from scrap 2X4's, while the leaves are constructed of discarded grocery bags.*
Above: *The copperhead in this sculpture entitled "Guardian," was carved of a single piece of basswood. The snake is resting on a base of marbled pine retrieved from the world's largest loblolly (with a girth of 27 feet) that stood in Dinwiddie County for 235 years before it was struck by lightning in 1975; photos by Dean Hawthorne Photography.*

had observed shrikes in the wild while serving as turf manager for the athletic fields for the Dinwiddie School System. A pair of shrikes, male and female, lived near one of the fields and followed him around while he groomed the field on a tractor. He studied the birds as, year after year, they returned to their habitat.

Several years ago, when Wilmoth first decided to carve a shrike, he contacted Spike Knuth at VDGIF and inquired about the availability of a study skin to use as part of his research for the carving. After some investigation, Knuth could not find a wildlife organization in the state that had a loggerhead shrike in any form as part of its collection. So, early this fall, Willy completed the sculpture of the shrike and presented it to VDGIF so that others might have the opportunity to view a lifelike carving of this rarely seen bird.

When Willy sets up an art gallery show, he almost always juxtaposes a positive sculpture against a negative one—a piece that displays the wonder of nature beside a piece that illustrates the destruction of the environment. The most delightful pieces are the positive ones, but the most inspiring are the negative ones. While the harsh realities they depict evoke a sense of sadness, they make viewers reflect on how their actions are threatening wildlife and their habitat. His pieces capture what animals are trying to say through the language of nature, making us feel through them the results of our actions on our surroundings and its inhabitants. Willy Wilmoth's sculptures communicate a strong, moving message about the environment that inspires reflection—and a new look at ourselves.

"When I carve, I try to reveal the beauty of our world and our meaning through closely observing the dependent relationships of the animal and its environment—as well as suggest what may happen to us if we disregard this relationship."—Willy Wilmoth. □

Barry Saunders is the coordinator of public relations at John Tyler Community College in Chester.

Top: *Loggerhead shrike by Willy Wilmoth.* ***Above:*** *"All that remains of this female Northern Harrier is a broken wing and a cartridge, a symbol of the evidence of man's destruction. This sculpture represents man's destruction of wildlife and nature, as is symbolized by the chestnut piece upon which the wing rests. Although the bird was destroyed by man, the chestnut trees that once populated the earth are being destroyed by a natural blight-that was spread by man." —W. Wilmoth. Photos by Dean Hawthorne Photography.*

Dana Bradshaw receives Carl Zeiss award; photo by Peter Stangel.

Department Biologists Honored for Conservation Work

Dana Bradshaw, a Department nongame and endangered species biologist, whose article "On a Wing and a Prayer" in the May 1992 issue of *Virginia Wildlife* sparked awareness about the plight of neotropical migratory birds nesting in Virginia, was honored recently by Carl Zeiss Optical, Inc. and the National Fish and Wildlife Foundation for his bird monitoring contributions to the Neotropical Migratory Bird Conservation Program (*Partners in Flight*).

Presenting Bradshaw with the first-ever, annual Carl Zeiss Optical Award at a September Neotropical Migratory Bird workshop in Colorado, Peter Stangel, Director of the Neotropical Migratory Bird Conservation Initiative of the National Fish and Wildlife Foundation, said: "Bradshaw has stimulated great interest by forming partnerships with national, state and local conservation organizations."

Karen Terwilliger, supervisor of the Department's nongame and endangered wildlife programs, was also honored this year. She received the coveted President's Award from the Virginia Wildlife Federation for her work in the conservation field. She was also presented with the Southeastern Section of the Wildlife Society's 1992 Outstanding Book, Bulletin, or Monograph award for *Virginia's Endangered Species, Proceedings of a Symposium*. This book, published cooperatively by the Virginia Department of Game and Inland Fisheries, the Virginia Department of Agriculture and Consumer Services, the Virginia Department of Conservation and Recreation, and the Virginia Museum of Natural History, is the most comprehensive publication to date recording the threatened and endangered species in Virginia. *Note*: These books are still available for sale, and can be ordered through the publisher. See the advertisement in this magazine for details. □

People Giving to Wildlife

Turner Sculpture

William and David Turner of Turner Sculpture in Onley, VA have been supporting Virginia's Nongame and Endangered Species Program through their words, their deeds, and their pocketbooks for several years now. In 1990, they presented VDGIF with a magnificent bald eagle sculpture to bring attention to the plight of this national symbol in our Commonwealth and its dramatic comeback with the help of VDGIF's Nongame and Endangered Species Program. In 1991, David Turner completed a limited edition of 200 bronze endangered Bewick's wrens solely to benefit Virginia's Nongame and Endangered Species Program. This project was so successful that in the fall of 1992, David cast a bronze of a rare northern flying squirrel, the second in what he envisions an Endangered Species series of bronze sculptures. Both editions will result in a $60,000 contribution to the Nongame Fund, well over 10% of the program's present operating budget.

VDGIF's Board of Directors presented the Turners with a certificate of appreciation for their work to help Virginia's wildlife, but our gratitude for the Turners' support extends far beyond any piece of paper.

*David Turner (**left**) of Turner Sculpture receives a certificate of appreciation from VDGIF Director Leon McFillen (**right**) which was presented to William and David Turner for their outstanding contributions to the conservation of Virginia's wildlife; photo by Mel White.*

Colonial Waterbird Conservation Effort

Ruth Beck, Bill Williams, Bill Akers, and Jerry Via were recently honored by VDGIF's Board of Directors for their outstanding contribution to the conservation of colonial waterbirds in VA. In 1975, these individuals took the initiative to begin a survey of the birds of Virginia's barrier islands. These four people, out of their own interest in the birds of our fragile coastal resources, recognized the need to establish long-term monitoring on the Eastern Shore. They contacted the landowners, conducted the surveys, and provided the results to a national database. Through their volunteer efforts, state and federal natural resource agencies and landowners alike have been provided this information, which has allowed us to develop partnerships and conservation strategies. It is their information, in conjunction with our aerial surveys, which confirmed the decline of several of our beach-nesting birds and lead to the listing of both the gull-billed tern and the Wilson's plover as threatened in the state. Their consistent, reliable observations have added significantly to our knowledge of the distribution and populations of these species over the last 18 years. This is a most significant contribution indeed, and an example of giving both heart, soul, and hard work to the conservation of wildlife in the state.

Kiptopeke Bird Banding Station

Fred Scott, Walter Smith, Charlie Hacker, Dorothy Mitchell, and John Dillard are largely responsible for the success and invaluable information that has been collected at Kiptopeke Banding Station over the past 29 years. Because of their initiative and persistence, the importance of this area to migrating birds was recognized in 1963, and over the past three decades these individuals have been responsible for banding over 250,000 birds of 110 different species, establishing a volunteer network of over 15 man-years of labor, and bringing the site's importance to the public, which resulted in its permanent protection as a state park. The Board of

At a recent board meeting on the Eastern Shore, VDGIF expressed its appreciation to a group of volunteers for their years of dedication, skill, and tenacity in helpmg to conserve Virginia's birdlife; photo by Carol Kushlak.

Directors of VDGIF recently applauded the contributions of these individuals to the conservation of wildlife in Virginia and across the Eastern seaboard with the information they have collected from their surveys, and the role they played in safeguarding this important site from development. Their selfless volunteerism and dedication has not gone unnoticed nor has their valuable information gone unappreciated by conservation professionals in the East.

Kiptopeke Raptor Banding and Hawk Observation Stations

In close association with the Kiptopeke banding station has been the raptor count station. It has been through the initiative and efforts of Bill Williams that the station was established as an official hawk lookout site by the Hawk Migration Association of America, and because of the assistance of Dot Silsby that a volunteer manpower network to operate the station from August through November was developed.

Of the 17 lookout sites, the Kiptopeke Beach site has recorded the highest or second highest totals statewide, usually over 10,000 individuals. The site consistently reports the highest accipiter and falcon numbers as well as other species, such as vultures, ospreys, and harriers.

Two other raptor banding stations on the Eastern Shore have been established in an attempt to learn more about the patterns of raptor migration. For 10 years now, 87-year-old Paul Baker has assisted us in trapping and banding raptors on Fisherman's Island. In addition, Dr. Mitchell A. Byrd of the College of William and Mary, longtime cooperator and contractor of VDGIF, is our advisor and member of the peregrine falcon recovery team, and recommended establishment of the raptor banding station at Wise Point. The Board of Directors VDGIF recently honored these individuals, along with Reese Lukei, who has also worked with us to compile data on migrating raptors, for their long-term dedication and extraordinary conservation efforts for the future of wildlife in Virginia.

National Foundation for the Protection of American Eagles

VDGIF received a $5,000 grant from the National Foundation for the Protection of America's Eagles, a nonprofit organization based in Pigeon Forge, Tennessee that serves to promote public awareness and research for bald eagles. This generous donation will be used to fund continuing research on the critical concentration area for bald eagles on the James River. Hopefully, the results of this study will reveal to us some of the reasons why the James River is so important to bald eagles, and help us to ensure this area's continued use by eagles. This money was sorely needed and greatly appreciated by VDGIF, especially in these lean economic years.

Willy Wilmoth

Willy Wilmoth, a nationally known environmental sculptor who works in wood, donated a sculpture of the state endangered loggerhead shrike to VDGIF in an effort to help further our educational efforts with rare and endangered species.

"The idea to carve the loggerhead shrike came to me when I realized how many people don't even know what the bird really looks like," said Willy. "How can we protect something if we can't even identify it?"

The sculpture has been placed on display in the Richmond office of VDGIF and will be used in educational programs. We are grateful to Willy for helping us further the cause of endangered species protection and survival in Virginia.

Preserving in bronze what we're losing in the wild

An Endangered Species Series by Turner Sculpture

Capturing the essence of Virginia's endangered species in bronze, David Turner of Turner Sculpture has just completed the second in his limited edition series to raise funds for Virginia's Nongame and Endangered Species Program.

This time, David has turned his artist's eye toward one of Virginia's rarest mammals, the Northern flying squirrel. An elusive, elf-like spirit of our mountaintop spruce forests, this tiny squirrel weighs no more than five ounces and is known only to three locations in Virginia. Strictly nocturnal, it emerges from its nest of shredded bark, lichens, and moss once darkness has fallen and glides silently from tree to tree, its outstretched feet unfurling the parachute-like flaps of skin attached to each wrist and ankle.

Here, David Turner's 7" high sculpture of a Northern flying squirrel (photo approximates actual size) is poised for flight on an old-growth snag covered with the lichens and bracket fungus which make up a large part of its diet.

Like the bronze sculpture of the Bewick's wren also featured on this page (less than 100 are left for sale), a limited edition of 200 Northern flying squirrels will be cast and sold solely to benefit Virginia's Nongame and Endangered Species Program, the program responsible for the management and protection of all the Commonwealth's rare and endangered wildlife. The money raised from the sale of these two sculptures will provide the program with over1/10th of its present operating budget.

Each sculpture has a purchase price of $325. Turner Sculpture will receive $175 to cover their production costs, while the remaining $150 will be sent to the Virginia Department of Game and Inland Fisheries as your contribution to Virginia's Nongame and Endangered Species Fund. A tax advisor should be consulted regarding the personal tax deductibility of this contribution. Each piece sold will include a certificate of origin and a letter confirming your contribution to the future of Virginia's wildlife.

You may order either the Northern flying squirrel or the Bewick's wren by sending a $325 check for each signed and numbered sculpture to: Turner Sculpture, Box 128, Onley VA 23418. For credit card orders, call: 804/787-2818. **Note:** If you have already purchased a Bewick's wren and would like the same limited edition number in the Northern flying squirrel edition, please send in your order as soon as possible.

Bewick's wren (height: 12 inches) by David Turner. Available for $325.

TURNER SCULPTURE

VIRGINIANS CARE Nongame Wildlife Fund '92